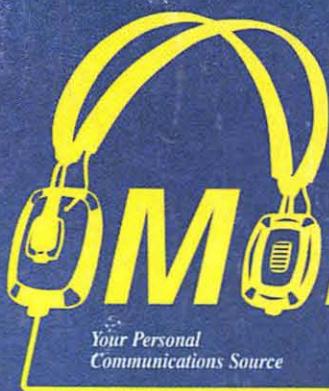


MT Reviews the Drake R8B and Trunk Tracking PRO-2050



Vol. 17, No. 5

May 1998

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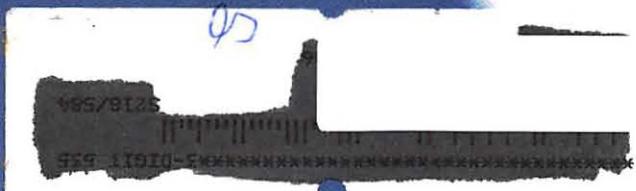
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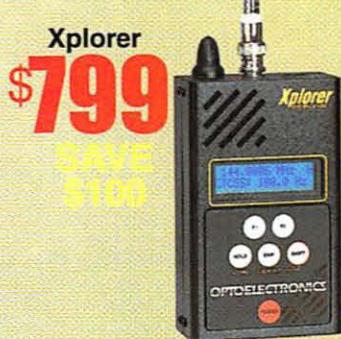
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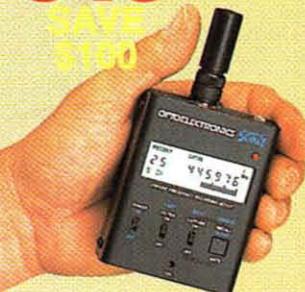
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Cover Story
Inside the House of the Blues

By Steve Douglass

The author (well-known to long-time *MT* readers and military monitors), takes us along on one of his favorite activities—witnessing breathtaking performance by the Blue Angels, the Navy's crack aeronautical demonstration team. The opportunity to view their practice run-through on press day meant he was able to check frequencies and program radios in advance of the show they put on for the public the next day.

There's no better lead-in to our aeronautical issue than to revisit this world-renowned team of ace pilots. Turn to page 8 for a taste of the excitement and their 1998 schedule, then program your scanner and head for the nearest airshow! Cover photo courtesy USN Blue Angels.

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BeeWee in My Back Yard 12

By Ronald Perron

Most people hate living close to a major airport, but for a scanner buff, it's nirvana. Baltimore Washington International (pronounced "BeeWee") airport is host to a fascinating variety of civilian and military aircraft, and *MT* provides the frequencies to plug into your scanner for some good aero listening.

CIA vs. Saddam: The Radio War of the Nineties 18

By Nick Grace

Whenever a military build-up draws world attention once again to this flash point in the Middle East, one can be sure that before weapons fire, the war of words is already well underway. The US has had an ongoing presence on the airwaves for years, though their tactics may change with administrations and political realities.


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By Michael Scofield

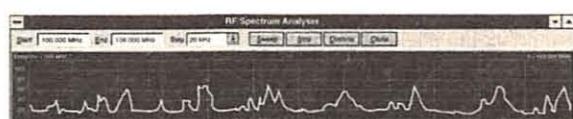


These low power, workhorse beacons used for aeronautical navigation get put to a novel use by our author. He issues a challenge and provides some education along the way. Oh say, how far can *you* see?

REVIEWS:

If you are wondering what the difference is between the BC235XLT TrunkTracker and Radio Shack's PRO-2050, turn to page 86 for the definitive answer by Bob Parnass. Shortwave listeners will find the first of a two-part, in-depth analysis of the Drake R8B by Larry Magne on page 88.

Page 90 carries John Catalano's promised review of the WiNRADiO Digital Suite. Turn to page 85 for reviews of two other useful accessories—the MFJ-418 Pocket Morse Code Tutor and the Opto Techtoyz Micro RF Detector.





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Note:

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By Fred Maia, W5YI
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FCC Agrees to Examine "Microstations" Two Petitions Could Legalize "Pirate" Radio!

More than ever, the FCC has its hands full combating unauthorized "pirate" radio stations. But it recently granted a rulemaking number to a petition filed by Nickolaus E. Leggett, N3NL, of Reston, Virginia, seeking to create a "Microstation Radio Broadcasting Service." If authorized, such a service could eliminate the need for illegal operation.

The FCC receives some 13,000 inquiries a year about low-power broadcasting. Nickolaus Leggett and his cosigners Judith Leggett and attorney Donald Schellhardt hope to expand availability of the airwaves beyond the limited existing opportunities. The FCC placed their petition on Public Notice on February 5, and granted it number RM-9208.

The petition proposes that one AM and one FM channel would be assigned to the entire licensed microstation service. Each station would be licensed to operate in a specific location. Transmitter output power would be limited to 1W, with antennas limited to 50 feet above ground or building.

Licenses would be granted on a first-come, first-serve basis with random selection to be used "if the Commission is swamped with license applications." Congress has forbidden the FCC to continue using random selection, or lotteries, to award station licenses, so federal law would probably have to change—not too likely given the lure of auction revenues.

Asked by *Radio World*, an industry newspaper, for his views on pirate broadcasting, FCC Chairman Kennard pointed out the trend of massive consolidation in the radio industry, with some companies seeking to buy hundreds of stations. He said that there is a need to create more outlets for expression, and that he is receptive to hearing more about licensing some form of low-power broadcasting. He has instructed the FCC's Mass Media Bureau to look into whether it is possible to create a low-power radio service.

The FCC already has a "Low Power Radio Service" (LPRS) in the 216-217 MHz band. But the FCC has carefully limited it to certain obscure uses, such as transmissions for the hearing impaired, a broad category of short range "health care assistance devices" and

anti-theft beacons. LPRS is legally a form of CB Radio and may not be used for broadcasting to the public. LPRS is not an unlicensed operation, instead devices are "authorized by rule" (i.e. no license documents are issued).

Low Power Microradio Broadcasting Service

Roger Skinner, of Pompano Beach, Florida, has also filed a petition with the FCC looking towards creating a Low Power FM broadcasting service. Skinner is president of TRA Communications Consultants, Inc. and also an Extra Class amateur, W4FM. The Commission has accepted the February 20th Petition for Rulemaking.

Skinner has worked in broadcasting since 1963 ...actually longer if you count the mini-station in his basement at age 16. He started his own consulting business in 1976 after working as a Top-40 DJ and engineer at about a dozen AM/FM radio stations. He now makes his living filing FM and LPTV applications for clients and also owns a low power TV station in Fort Lauderdale, Florida.

"I have been working on my LPFM petition for almost two years," Rodger told us. "I have always wanted to own a radio station, but like most I have not been able to afford to buy one. The 100 kW FMs here now are going for \$50 million."

Skinner says that four distinct types of Low Power FM service are needed throughout the country. First is for the hobbyist who wishes merely to transmit a signal to another part of his/her house or other needs. This is already adequately provided for under current Part-15 rules, which limit radiation to 250 uV/m at 3 meters from the antenna.

Secondly, there is a need for "special-event" stations to broadcast information concerning a special event such as a boating regatta or auto race for a limited time period. These stations may only need to broadcast for a weekend or a few days related to the event in question. There should be a streamlined system to coordinate these one-time requests, where coverage requirements might typically

be one to two miles, around a park, racetrack, etc. Skinner refers to these as "LPFM-3 Special Event" permits.

A third type of station is needed to serve small areas within larger communities, such as are operated today by some so-called "pirates" with a typical range of under five miles. Many in this group will prefer to operate with volunteers from the community offering a variety of programs and viewpoints by area residents and offer a loosely structured form of broadcasting, often without set hours of operation.

This LPFM-2 class station could be started at little cost. The station would have a maximum power limit of 50 watts (ERP), a minimum power limit of 1-watt (ERP) and maximum antenna height of 150 feet.

Finally, Skinner believes there is a need for a more structured type of station, again with local owners, who themselves will invest the time and money needed to create a station that will be responsive to local needs and interests. LPFM-1 stations will be the highest class with the largest possible coverage area as well as the most stringent requirements.

This type of station will mirror more closely the typical full-power station, may consist of a few employees in addition to the owner(s) and have a 24-hour per day continuous broadcast schedule. A minimum power level of 50 watts (ERP) and a maximum power level of up to 3 kilowatts (ERP) will provide a coverage area of up to about fifteen miles, similar to the old Class A FM stations.

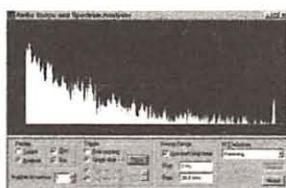
LPFM would utilize commercial FM channels 221 (92.1 MHz) through 300 (107.9 MHz) with sufficient channels available to provide one or more new channels to each market area. Applications for the temporary special-event LPFM-3 stations could be handled by volunteer frequency coordinators so that interference is not caused to existing stations.

The petition for LPFM is online for reading or downloading from: <<http://www.concentric.net/~radiotv>>. Rodger Skinner's e-mail address is: radiotv@cris.com.

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HR2369 Passes the House

As anticipated, the cellular protection bill H.R.2369 came to a vote and passed the House with one dissenting voice in early March. The Bill now moves to the Senate Commerce Committee for further action. See this month's "Scanning Report" for all the details.

Lost in the clouds

A twin-engine plane flown by pilot Tom Cleary drifted 150 miles over the Atlantic on its way from Rochester bound for Newark, New Jersey. Above the clouds at 9,000 feet and with direction-finding and communications equipment knocked out due to electrical failure, the pilot was completely lost.

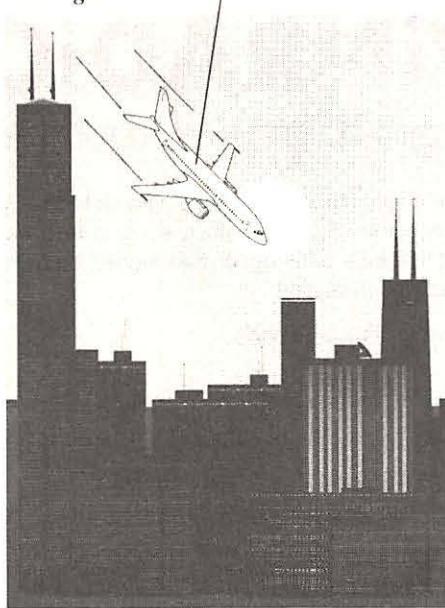
When the plane came up missing, air traffic controllers contacted the US Coast Guard. Two F-16s caught up with the plane and one signalled for him to follow by lighting his afterburners and flashing his exterior lights twice, said Lt. Col. John Dwyer. Once within 60 miles of the coast, two F-15s took over and escorted him to Atlantic City International Airport.

"He was real happy to be back, real happy to be alive," said Dwyer.

Clue: on a plane, by unknown passenger, with a cellphone

Reports forwarded to us by email claim

"Well, I'd better get off the cell phone, Margaret. We seem to be coming in for a landing..."



that a recent crash by a China Airlines A300 may be blamed upon interference from a cellular phone. According to the correspondent Tsung-Hsien, "the [Chinese] government has announced a new rule which can send anyone making cellular phone calls on an airplane to prison up to five years. If an accident is caused by the phone call, the penalty can go up to a life sentence."

Many US airlines recommend passengers

switch off their phones, but how many recognize the difference between switching off the phone and just not talking on it? And did the cellphone really do it?

FAA says cell site needs paint

In the search for existing structures on which to erect cellular antennas, Cellular One thought they had a good deal going; they would paint and restore a rusty old water tower and remove a second dilapidated tower. In return they would negotiate a bargain price on renting the tower to support their antennas.

Now the FAA says the water tower (which predated FAA safety regulations) is close enough to the Schenectady, NY, county airport that it may have to be painted with an orange and white checkerboard instead of the tasteful sea green and gray that had been planned. So much for cellsite stealth and good community relations!

Tower Space for Rent

One type of structure previously dismissed as a potential host to PCS and cellular antennas is the AM broadcast tower. As explained in last month's cover story, the tower is "hot" with RF energy, since the tower is the antenna.

However, consultants from Lawrence Behr Associates, Inc. (LBA), based in Greenville, NC, have announced a new proprietary conversion adaptation of these AM towers to

BULLETIN BOARD

May 3: Hagerstown, MD

Great Hagerstown Hamfest at Hagerstown Junior College, Exit 32B off I-70 to Edgewood Drive, right at Home Federal Bank. Contact Don Jones KB8WHW 304-728-7769. VE exams 9 a.m. (no charge, walk-ins accepted but preregistration requested) and seminars. Talk-in 147.090+ 8 a.m. to 3 p.m., \$5 admission. Food, prizes, indoor facility and tailgating.

May 15-17: Dayton, Ohio

Dayton Hamvention at Hara Arena. Come see Grove Enterprises/MT/ST and see a live demo of the latest WiNRADIO, booth #573 / #591.

May 30: Loveland, CO

Superfest Swapmeet sponsored by Northern Colorado ARC at Larimer County Fairgrounds, 700 S. Railroad. Contact Michael Robinson N7MR, 970-282-1167 for info. Free parking; commercial exhibitors, refreshments, VE session. Talk-in 145.115-100Hz, 146.52. 8 a.m.-3 p.m., \$3 admission.

June 7: Butler, PA

44th Breezeshooters' Hamfest (largest in western PA) at the Butler Farm Show grounds, north of Butler (PA Rt 68 East from I-79). Contact Bob Ferrey Jr. N3DOK 712-367-2393 or see <http://www.users.sgi.net/~wolfie/> for info. Talk-in 147.96/36. \$5 admission.

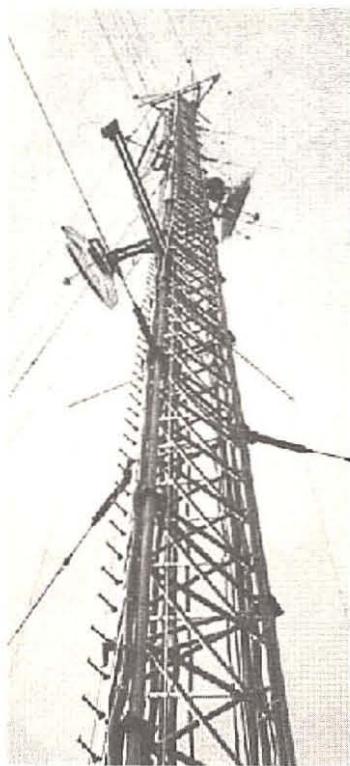
June 7: Queens, NY

Hall of Science ARC Hamfest held at the NY Hall of Science parking lot, Flushing Meadow Corona Park, 47-01 111th St. Contact Stephen Greenbaum WB2KDG 718-898-5599, WB2KDG@bigfoot.com. Free parking; prizes, food. 9 a.m. - 3 p.m. \$5 donation. Talk-in 444.200+ PL 136.5.

New web sites:

Capitol Hills Monitors: www.hyattesvillefd.org/chm/
Cumbre DX: www.ralabs.com/cumbre
Glenn Hauser's World of Radio: www.angelfire.com/ok/worldofradio
The Celestial WWW: celesttrak.com

COMMUNICATIONS



allow them to support antennas for wireless communications.

"The ability to mount new antennas in an unobtrusive manner on [as many as] 10,000 existing towers will minimize the impact of wireless antennas in the community and encourage communities to expand the technology and the coverage areas," said Win Donat, President of Lawrence Behr Associates. "It creates an entirely new tower rental income stream for the AM segment of the broadcast industry, a sector of the industry generally regarded as depressed."

This spring more will be pushing up than just daisies

Every "stealth" solution to the coming cellular/PCS/HDTV tower explosion is a help, even if it's a drop in the bucket compared to the number of sites needed. Communities and even states are beginning to wake up to the need to establish site guidelines, and fast!

We have received news clippings and email from Arizona, Massachusetts, New Hampshire, New York, North Carolina, Vermont, and Washington regarding communities making a concerted effort to hammer out tower laws. Town boards are struggling to compose ordinances which match the desires of the neighborhood with the interests of the cellphone companies (which now receive rights similar to public utilities), and which

don't violate the mandates of the 1996 Telecommunications Act.

Vermont is even attempting to mount a challenge to the Telecommunications Act. Vermont Sens. Patrick Leahy and James Jeffords and Rep. Bernard Sanders are sponsoring legislation (S 1350 and HR3016) that would return the power to the towns.

Is your township prepared? You'll only be allowed a limited amount of time to place a moratorium on new construction while your township, county, or state addresses the question. Waiting until the cellsites begin to sprout up may be too late!

Shaking out the digital bugs

The nation's first high definition television (HDTV) broadcast was a real heartstopper—literally! WFAA-TV in Dallas beat all other US stations to the punch when it put its newly received Harris transmitter on air February 27th. It was also the first to encounter a unique interference problem.

At Baylor University Medical Center, sev-

"Gee, I can't imagine what's going on with these crazy heart monitors. Hey, isn't 'General Hospital' on right now? Somebody crank up the HDTV!"



eral of its 60 wireless heart monitors stopped sending data. Late that evening, the hospital thought it had the problem fixed, only to have it start all over again the next day. Steve Juett, senior clinical engineer, knew the low-power, unlicensed heart monitors used frequencies allocated to TV channels 7 and 9. As soon as a colleague mentioned WFAA's inauguration of digital TV on channel 9, he had the answer.

"It was very clear to me what was going on," Juett said. When WFAA's transmissions stopped at night, so did the problems with the monitors.

Baylor has decided to purchase a new monitoring system, but, meanwhile, WFAA is concerned about educating other engineers about this unforeseen side effect of a mode customers can't even see yet—since no major manufacturer will be selling TVs that can pick up the digital signal until this fall.

Communications is compiled by Rachel Baughn with help from this month's reporting team: Anonymous, New York; David Alpert, New Jersey; Roy Beavers, e-mail; Jean Foley, email; Wm. Hearty, Ohio; Steve Kaatz, Michigan; Maryanne Kehoe, Georgia; Kevin Klein, Wisconsin; Sergey Kolesov, Ukraine; Kenneth Lensing, Arizona; Claudio Morales, Argentina via Larry Van Horn; Dale Newton, VT; Ryan, Long Island; Bob Mills, California; Doug Robertson, California; Richard Sklar, Washington. We welcome clippings from your world of radio: send to *MT* headquarters or email *mteditor@grove.net*.

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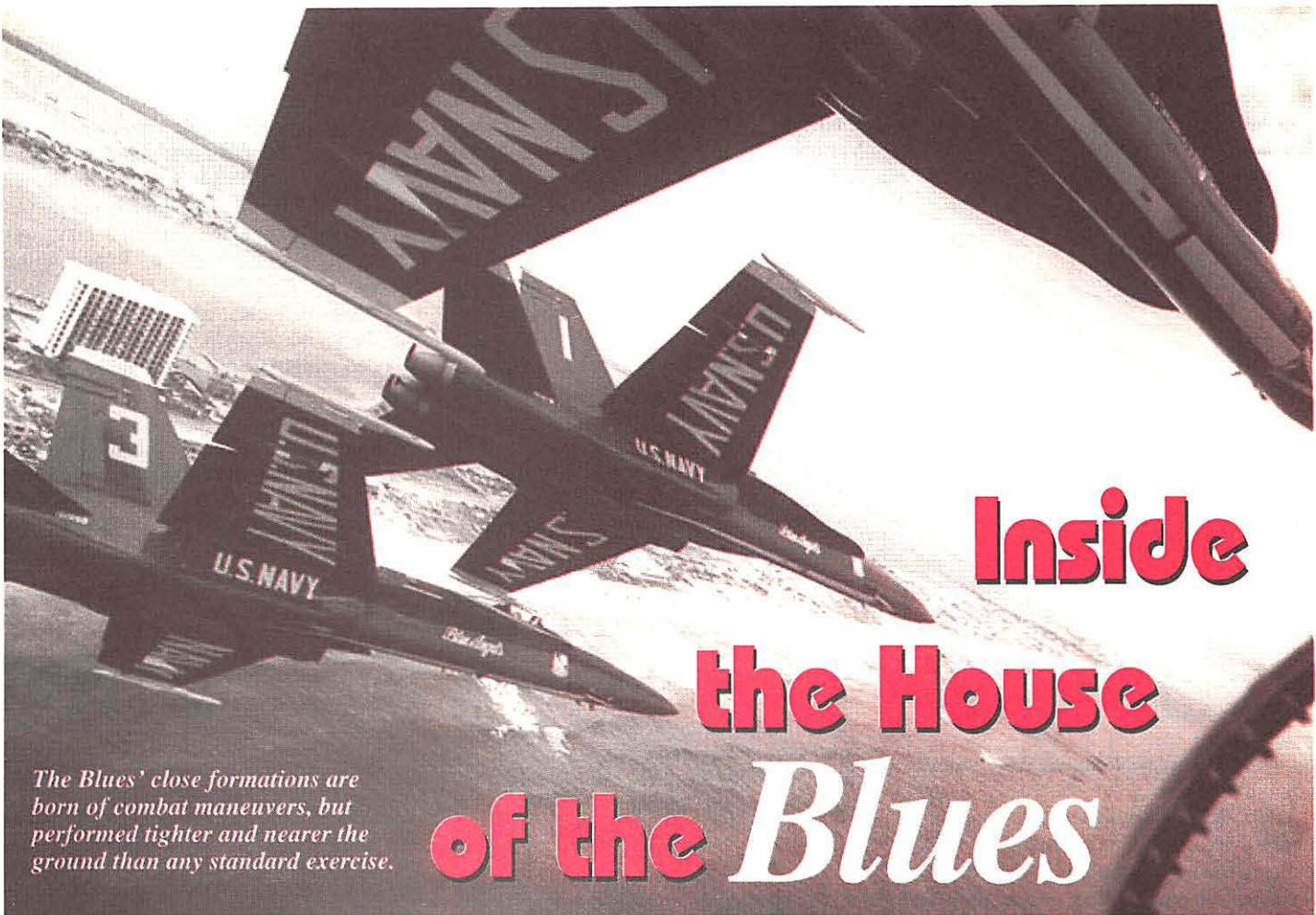
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Inside the House of the Blues

The Blues' close formations are born of combat maneuvers, but performed tighter and nearer the ground than any standard exercise.

Liberal, Kansas, is flatter than the proverbial pancake. In fact, Liberal is famous for pancakes. Each year they hold a pancake race right down the middle of main street. Lovely maidens brandishing skillets, flipping flapjacks and galloping for all they're worth is a major tourist draw, but that is not why we are here.

My monitoring buddy Frank Murphy and myself have made the trek from our home in Amarillo due north to Liberal to meet the Blues.

Today is press day at the Liberal Air Museum. Tomorrow the annual Mid-America Airshow 97 kicks off. Frank Murphy, a photographer for an Amarillo television station, is here to shoot some video for the local news. Naturally, when I heard of his assignment I boldly invited myself along.

I wasn't about to miss out on an exclusive private airshow put on for the members of the media and airshow staff by the Navy's Blue Angels Flight Demonstration Team. It would be an excellent chance to see the Blues in

By Steve Douglass
Photos courtesy of the USN Blue Angels



action and also monitor the exciting military communications involved in putting this top team in the air.

I brought along with me on this trip my trusty PRO-43 and my new Bearcat TrunkTracker. Although this new gee-whiz scanner is great at intercepting those hard to follow trunked systems, today we will be using it to search out the VHF air bands for airshow action. The PRO-43 will be tasked

with scanning the UHF military frequencies for the Blues air to air communications.

■ Blasts from the Past

The Liberal Air Museum is quite a thing to see. Who'd have thought that in the middle of the corn belt one would find such an excellent aviation museum? The displays are first rate.

Hanging from the rafters inside the main museum is one of my favorite aircraft, the F-

104 Starfighter. This 60s era superplane was the product of the amazing Skunk Works engineers and would lead to a new generation of secret spyplanes such as the U-2/TR-1 Dragonlady, SR-71 Blackbird and the F-117 stealth fighter.

As much as we wanted to linger and gawk at the museum displays, we had an appointment to keep with the Blue Angels. The distinct sound of an F/A-18 warming up drew us away from the fascinating yet very static displays. I promised myself that when we returned the following day for the airshow I would spend more time in this museum.

■ The Hornets

Outside, the beautiful blue and yellow F/A-18 Hornets glisten in the bright Kansas sunlight, but make no mistake: these glitzy showbirds can be transformed into warbirds in short order.

The F/A-18 is now the primary fighter/attack aircraft in use by the U.S. Navy. An improved version called the F/A-18E Super Hornet will be protecting carrier battle groups well into the next century. Although the Super Hornet is faster, stealthier and billed as more lethal than the F/A-18 the Blue Angels fly, looking at these stunning ambassadors in blue warming up on the tarmac it's hard to think they could ever become obsolete.

■ Best of the Best

It goes without saying to be a Blue Angel pilot you have to be better than good. To qualify to become one of the best of the best you have to have thousands of hours in tactical fighter aircraft. You have to be able to take off and land on the rolling deck of an aircraft carrier on the stormiest of nights and the dreariest of days.

Maverick, loner "Tom Cruise" types need not apply. No hot shots here. The precision maneuvers of the Blue Angels call for teamwork and tons of trust.

■ Home and History of the Blues

Formed in 1946 in response to the Navy's need to promote naval aviation, the Blue Angels soon became the premier military flight demonstration team.

Home is Naval Air Station Pensacola, but the Blues are



The author (below) wasn't about to miss out on a "private" airshow by this crack flight demonstration team.



"Fat Albert" is the C-130 which carries the team's maintenance equipment and supplies.

found there less than half the time. The Blue Angels fly six days a week, 300 days a year either preparing for or performing in airshows across America and the world. In the off season you'll find the blues training at their winter camp at Naval Air Facility El Centro, California.

Eight sleek F/A-18 and a chubby C-130 Hercules make up the Blue Angel's flight team. The team is backed by the Navy's best maintenance and support crews. All work as a well-honed integrated team to keep the Blues the best in the modern skies.

Although Frank, myself and a small band of museum workers were the only ones on hand to witness the Blue Angels practice show, they carried it off as if there were thousands in attendance.

Everything, from the ground crewmen removing the wheel chocks to the F-18s taxiing out, is done in perfect synchronization reflecting the dedication of all members of the team.

■ Showtime

The engines spool up and the jets taxi out to the active runway, the pilots giving their ground crewmen a jaunty salute for a job well done.

For the next forty-five minutes we were treated to an amazing exhibition of military air power.

Like homesick angels the Blues streak up into the deep blue with astonishing speed, power and grace. Rolls and loops thrill our eyes and afterburners shake us to the marrow. To borrow a well-known Navy aeronautical phrase, both Frank and I are "glad to be here."

The Blue Angels Flight Demonstration

Team is made up of eight aircraft. Each has an important role.

In aircraft number one is the flight leader and commander of the Blue Angels, otherwise known as the Boss.

In aircraft number two is the right wing pilot—his position in the Diamond Four formation.

Just opposite him in aircraft number three is the left wing pilot.

The slot pilot in jet number four has to be good. He flies in the precarious position below and behind the diamond four, constantly pushed around by the wake of the six powerful jets flying just feet away from his cockpit canopy.

In Hornet number five is the lead solo. Lead and the opposing solo, in jet number six, perform the eye popping “cross over break” maneuver where the jets appear to almost collide with each other.

The most difficult maneuver for the two opposing solos is the “Tuckover Roll.” The two aircraft start to the right of the airshow crowd, flying in tight formation inverted at 150 feet off the ground and traveling at 450 miles per hour. Just prior to the center of the crowd the lead solo will make a short radio call, “ready ... hit it.” At that moment both aircraft perform a maximum stick deflection roll to the left without seeing each other. If either pilot is late, they will collide. Talk about blind trust!

■ More Than Just Fancy Flying

Although the flying is graceful and beautiful to watch, it is born of military necessity. The maneuvers are the same used by jet aces



The ground crew is a respected part of the Blue Angel's team.

in military combat, compressed, refined and brought down to an altitude that lets us poor groundlings observe.

For example, the Blues take the standard tactic of formation flying, bring the aircraft closer together (to within a heart-stopping three feet) and down to a hundred feet over airshow center. With no room for mistakes, the diamond four loops, rolls and charges through classic air combat maneuvers that would make even the best hot dog pilots stop to admire.

To achieve this type of flying precision the Blues, practice, critique, practice, critique and practice again.

■ Zen and the Art of Flight

Before every show the Blues meet for a ritual that to the layman might seem a bit strange. Seated around a large table the pilots sit, most of them with their eyes closed. Some are scrutinizing aerial photos of the area. All are locked in a trance-like state visualizing the

airshow routine while the boss calls out flying cues as if talking on an invisible radio. The pilots hold invisible make-believe throttles in their hands and make small movements, flying the maneuvers in their heads.

The calls sound like a strange enchanted military mantra, “easing power..smoke on..a lit..tel.. more pull.. ready boards.. boards.”

This previsualization session helps the Blues practice the cadence, rhythm and flow of the airshow routine without ever leaving the ground. It becomes as automatic as breathing or more like a well rehearsed dance routine, a jet-powered ballet among the clouds.

Attending one of these practice sessions

BLUE ANGELS FREQUENCIES

LIBERAL AIRSHOW



BLUE ANGELS

“BOSS” : 307.00

OPPOSING SOLO : 390.100

GROUND SUPPORT & MAINT.

142.025, 143.600, 142.625

MID - AMERICA AIRSHOW

AIRSHOW CONTROL: 123.100

GOLDEN KNIGHTS: 123.425

123.475, 42.350, 32.300

KANSAS CITY CENTER

125.00, 132.200, 132.100,

134.00, 135.200, 281.400,

290.800, 319.00, 324.100,

379.200, 387.100

KANSAS MILITARY FREQS.

AR-330 PRIMARY: 305.500

AR-330 SEC: 260.200

AR-653 PRIMARY : 324.400



also helps military monitors understand the cryptic radio calls they will intercept.

■ Monitoring the Blues

Monitoring the Blues adds a new dimension of enjoyment to the demonstration. After searching out the Blue Angels frequencies and programming them into my PRO-43 I found the best technique is to monitor the Boss's calls on headphones. This helps shut out some of the confusing ambient noise around you and helps you hear the quick staccato calls over jet noise.

We found the Blue Angels's Boss transmitting on 307.700 MHz and the opposing solo on 391.100. Ground support and maintenance used the following frequencies: 142.025, 143.600, 142.625 and 143.600 MHz. Airshow Control could be found coordinating airshow acts on 123.100 MHz.

Other Liberal area military aviation related communications were uncovered as well on the following Kansas City Center frequencies: 324.100, 319.000, 379.200, 290.800, 281.400, 387.100, 133.200, 125.200, 134.000, 132.100 and 132.200 MHz.

We also were treated to a parachute drop by the U.S. Army's Golden Knights. The Golden Knights relayed wind speeds and drop instructions to their C-130 on 123.425 while their maintenance details could be found using 42.350 MHz.

In contrast to our exclusive private airshow, the next day we found ourselves on the flight line among twenty thousand rabid airshow fans, but the show was no less exciting. Our preshow-show had helped us prepare as much as the Blues. Armed with our scanners, the right frequencies, cameras and binoculars we wouldn't be distracted from enjoying the Blues by searching for active frequencies.

I lugged my gear to the flight line: a lawn chair, scanners and a portable Walkman style CD player. I had wired my headphones to be able to hear the Blues communications on the PRO-43 as well as my personal soundtrack that would play through the CD player. You may laugh, but as the Blues began to taxi I started the music—the sound track from *Crimson Tide* that I knew would fit their flying style like it was composed just for them.

As the Blues took to the skies, so did my thoughts, propelled to great heights by the music and the crystal clear voice of the Boss reciting the calls and cadence that coordinated the great flashing blue and yellow Hornets.

For just a split second I could imagine the G-forces pressing down on my body as the lead solo called for the Tuckover Roll. For a brief moment in time.. I was a Blue Angel.

BLUE ANGELS 1998 PERFORMANCE SCHEDULE

APRIL:	25-26 NAS Norfolk, VA, Air Show	AUGUST:	1-2 Hanscom AFB, MA, Air Show
MAY:	2-3 Ft. Lauderdale, FL, Intl. Air and Sea Show	8-9 Seattle, WA, Seafair Air Show	
9-10	Chattanooga, TN, Air Show	14-16 MCAS Miramar, CA, Air Show	
16-17	Andrews AFB, MD, DoD Open House	22-23 Chicago, IL, Air-Water Show	
20	USNA Annapolis MD, Air Show	29-30 Offutt AFB, NE, Open House	
22	USNA Graduation Fly-By		
24	NAS Meridian, MS, Air Show		
30-31	NAS JRB Ft. Worth, TX, Air Show		
JUNE:		SEPTEMBER:	
6-7	Coney Island, NY, Air Show	5-7 Chesterfield, MO, St. Louis County Air Show	
13-14	Eau Claire, WI, Air Show	12-13 Halifax, Canada Nova Scotia Air Show	
20-21	Grissom ARB, IN, Air Show	19-20 Warner Robbins AFB, GA, Open House	
27-28	Niagara Fall ARS, NY, Thunder over Niagara	26-27 Reading, PA, Redding Aerofeast	
JULY:		OCTOBER:	
4-5	Traverse City, MI, Cherry Festival	3-4 Stockton, CA, Air Show	
11	Pensacola Beach, FL, Air Show	10-11 San Francisco, CA, Fleet Week	
18-19	Dayton, OH, Air Show	17-18 Houston, TX, Air Show	
25-26	Latrobe, PA, Air Show	24-25 NAS Jacksonville, FL, Open House	
		31-10/1 NAS New Orleans, LA, Air Show	
		NOVEMBER:	
		FL, Open House HOMECOMING	

THUNDERBIRDS 1998 SCHEDULE

APRIL:	25-26 Point Mugu NAWS, CA, Air Show	AUGUST:	1-2 Vandenberg AFB, CA, Air and Space Show
MAY:	2-3 Knoxville, TN, Air Show	8-9 Abbotsford, Canada, Air Show	
9-10	San Angelo, Texas, Air Fiesta	15-16 Big Flats, NY, Wings of Eagles Air Show	
16-17	Fairchild AFB, WA, Aerospace Day	29 Minot AFB, ND, Open House	
23	Kelly AFB, TX, Air Show	30 Grand Forks AFB, ND, Open House	
27	Air Force Academy, CO, Graduation		
30	Elmendorf AFB, AK, Open House	SEPTEMBER:	
31	Eielson AFB, AK, Open House	5-7 Cleveland, OH, Air Show	
JUNE:		12-13 Westover ARB, MA, Open House	
6-7	N. Kingstown, RI, Air Show	19-20 Durango, CO, Air Show	
13-14	Portland, OR, Rose Festival Air Show	26-27 Salinas, CA, Air Show	
20-21	Santa Fe, NM, Air Show		
27-28	Davenport, IN, Air Show	OCTOBER:	
JULY:		3-4 Sioux City, IA, Mid-America Air Show	
4-5	Battle Creek, MI, Air Show	10-11 El Paso, TX, Amigo Air Show	
11-12	Plattsburgh AFB, NY, Air Show	17-18 Muskogee, OK, Air Show	
18-19	NAS Whidbey Island, WA, Sea 'N' Sky Fest	24 Columbus AFB, MS, Open House	
22	Cheyenne, WY, Air Show	25q Little Rock AFB, AR, Air Show	
25-26	Selfridge ANGB, MI, Air Show		
		NOVEMBER:	
		31(Oct)-1 Victorville, CA, George Air Show	
		7-8 Lake Charles, LA, Air Show	
		14-15 Lake City, FL, Air Show	



U.S. Army Golden Knights.

Baltimore Washington International Airport

BeeWee in My Backyard



View of the terminal entrance and the control tower with antennas.

BWI's new international terminal just opened in Dec 1997.

By Ronald A Perron
Photos by Dan Breitenbach,
provided courtesy of the Maryland
Aviation Administration

For some people, living near a major metropolitan airport is a real pain. However, for an aviation and scanner buff like myself it's like being thrown into the briar patch.

I live about six miles from Baltimore-Washington International (BWI) Airport — "Bee Wee" as it's sometimes pronounced on the air. My house lies in between the approaches to runways 33 Right/33 Left. The location gives me the best of both worlds. I can hear both the aircraft and the controllers and then go out in my backyard and watch the aircraft.

I've always been interested in aviation and did some real-life "scanning" when I served in Uncle Sam's Air Force. I recently decided to get into the hobby after reading a copy of *Monitoring Times* and browsing an internet site on military communications. I bought a Radio Shack PRO-2045 and linked that up to a D-130J discone up in my attic.

Boy, does my equipment ever get a work out. BWI is one of the busiest airports in the Middle Atlantic area. Karen Black of the Airport's Information Office says that in 1997 there were more than 266,000 take offs and landings. That compares favorably with totals from the other major airports in the area, Dulles International and Washington National. That total is certainly going to increase as major improvements are made to handle more airlines and passengers.

At the present time nineteen different scheduled airlines, both domestic and for-



BeeWee's modern new terminal doubles its international passenger capacity.

sign, operate from BWI. They run the gamut from the standard U.S. carriers US AIR, United, Southwest, etc. to foreign carriers such as Air Aruba, British Airways, El Al, Icelandair and Mexicana.

Starting in April of this year, the U.S. Air Mobility Command will use BWI to service various military locations in Europe. Using contract commercial carriers such as Air Transport International, American Trans Air and World Airways, AMC passenger operations from BWI are expected to grow to more than 20 flights per week.

The AMC and the foreign carriers are tenants in the newly opened (December 1997) International Terminal. This new addition will double BWI's current international passenger capacity. Eventually, the terminal will expand to a total of 15 gates as usage increases.

In addition to the passenger side of things there is a bustling cargo operation served by all the major bulk carriers. Emory Air Freight, DHL, UPS, and FedEx are among the many users. Last year more than 255,000,000 pounds of freight was handled by the cargo terminal.

BWI's handy location about halfway between Baltimore and Washington, DC, makes it a natural for executive and business travel. The General Aviation Executive Terminal, operated by Signature Flight Support, is open 24 hours a day, seven days a week. So there's a never-ending parade of corporate and general aviation aircraft and helicopters to tune into.

There's a bonus for us sports fans, too. The cargo terminal plays host to the charter aircraft used by several baseball and football teams as they visit Baltimore to play the Orioles and the Ravens.

So if you're interested in commercial aviation there's a wide variety of domestic and foreign commercial aircraft to whet your appetite. BWI is really user-friendly in this regard. There's a specially constructed observation deck at the domestic terminal that lets you enjoy a fine meal and a beverage and also see the aircraft close up and watch the take-offs

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- Continuously adjustable 12 dB bass boost/cut circuitry enhances bass response for high fidelity music, and reduces low frequency rumble for sharper voice clarity. LED light bar readout shows amount of boost or cut and is calibrated in dB.
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- Continuously adjustable 40 dB deep notch circuitry effectively takes out interfering heterodynes, providing clear reception. Notch width and frequency are adjustable.
- Special circuitry allows the peak and notch to exactly track each other. Therefore an undesired signal can be peaked, making it easy to find, then by hitting the notch button it simply disappears!
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and landings from a warm, dry area with cushioned seats.

For hardier folks, the airport has constructed a large open observation/parking area at the end of runway 33. When the weather is nice, it's common to see families there enjoying a warm evening watching the aircraft take off and land. Many of the on-lookers are also carrying their portable scanners to enhance their enjoyment.

■ Federal, Military, and VIP Hub

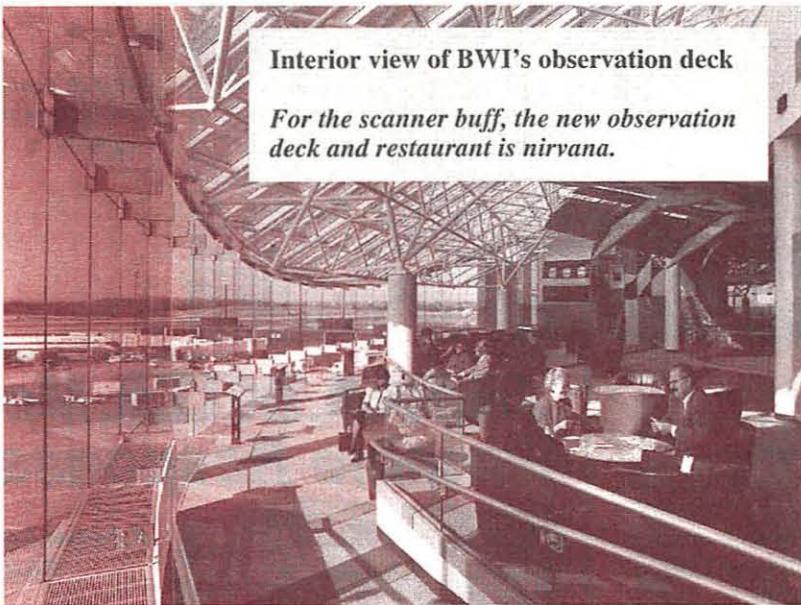
For those like myself interested in military flight activity, BWI is a convenient traffic hub. Patuxent Naval Test Center, Dover Air Force Base, Andrews Air Force Base, several Army airfields, as well as the home bases of the Maryland, Pennsylvania, West Virginia and Delaware Air National Guards are all located within 100 miles of BWI. This dense military flight training and operations environment provides lots of opportunities for some very interesting loggings and visual sightings as their aircraft land at or transit the BWI control areas.

Probably some of the most unique are the periodic visits by the desert-camouflaged C-130s of the Egyptian and Saudi Arabian Air Forces. Several times a year they fly in to pick up avionics and other electronic equipment for their F-16s and AWACS aircraft. This equipment is produced at the Northrup-Grumman plant located on the edge of the airport. It's quite a sight to see these distinctive aircraft parked at the outer edge of the airfield in plain view. I've even seen one or two civilian Saudi Arabian (Saudia) aircraft and a commercially registered IL-76 parked here.

Since BWI is only about 40 miles from Andrews Air Force Base, there are regular visits by aircraft from units based there. These visits are highlighted by the Presidential VC-25s (SAM 28000 and SAM 29000) practicing touch and go's and approaches. The airport is one of the alternate fields for these aircraft should they have to divert from

Interior view of BWI's observation deck

For the scanner buff, the new observation deck and restaurant is nirvana.



Andrews, so the pilots must periodically familiarize themselves with the airfield area. I also assume that training for any new pilot or co-pilot assigned to the Presidential unit includes trips to BWI.

Other Andrews aircraft that I've noted "visiting" BWI are the non-presidential Special Air Mission (SAM) Gulfstreams (callsign *Venus*) of the 89th Air Wing; EA-6Bs (callsign *Cobra*) from VAQ-209 at the Naval Air Facility; and F-16s (callsign *Combat*) from the DC Air National Guard's 113th Fighter Wing. I believe that all of these visits are for aircrew airfield familiarization and flight proficiency training.

The airport also gets a fair share of visits from Priority Air Transport (PAT), Joint Operational Support Aviation (JOSA) and AMC's

Reach aircraft. For me there's nothing quite like the thrill of listening to a Reach "heavy" aircraft working with a BWI controller and then going out on my deck and watching a C-141 or C-5 fly over the house on its way into the airport. For me that's what scanning is all about.

The Maryland Air National Guard's 175th Wing, based at Martin State Airport just a few miles northeast of Baltimore, also uses BWI for training. Their A-10s (callsign *Raven*) and C-130s (callsign *Witch*) are routinely noted using BWI airspace and controllers. The A-10s usually transit BWI airspace

to/from Martin State on their way to special training areas near Patuxent Naval Air Station or near Willow Grove, Pennsylvania, while the C-130s use the local airspace for navigational flight training. EC-130s from the Pennsylvania Air Guard's 193rd Special Operations Group (callsign *Baton*) from Harrisburg Airport also use BWI facilities for flight training.

NASA's Headquarters are only about 20 miles down the road in Greenbelt. There are periodic visits by various NASA aircraft into and out of BWI; especially when there is activity at NASA's Wallops Island Flight Facility which is located on the Virginia seashore, not far from the Baltimore-Washington area.

Other interesting local users are some of the area's law enforcement units. The Maryland State Police Aviation Unit (callsign *Trooper*) operates eleven Aerospatiale SA-365N helicopters used for search and rescue, medical evacuation and police search duties. They are based at Martin State Airport but are regularly heard operating with BWI controllers. The Anne Arundel County Police Department also operates aircraft out of the General Aviation Terminal.

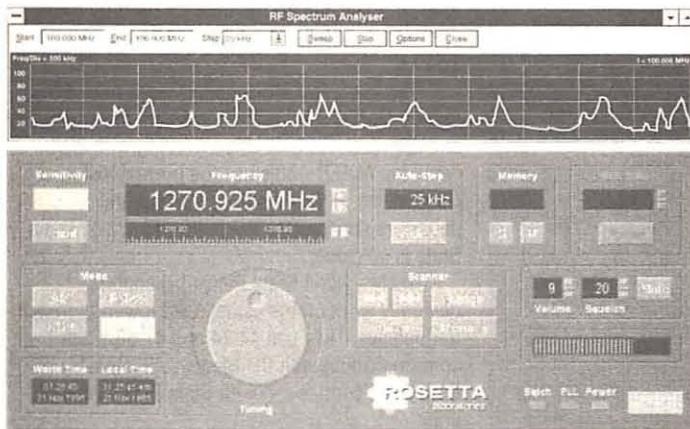
No, you won't find me complaining about living so close to a major airport: Just when I think it's another routine logging day, up pops a Saudi, Egyptian, NASA or unusual civil aircraft to make things interesting. With BWI almost in my backyard there's never a dull scanning moment.



Below, aerial view of BWI with terminals and runways. BWI is becoming one of the busiest airports in the midatlantic area.

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ANT 3	Grove Mini-Skywire	\$29.95
ANT 7	Scantenna	\$39.95
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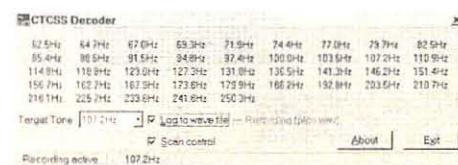


See weather facsimile, read packet and ACARS messages, decode DTMF and CTCSS tones, find specific signal types while skipping over unwanted stations, analyze audio waveforms (0-20 kHz), and digitally record and play back

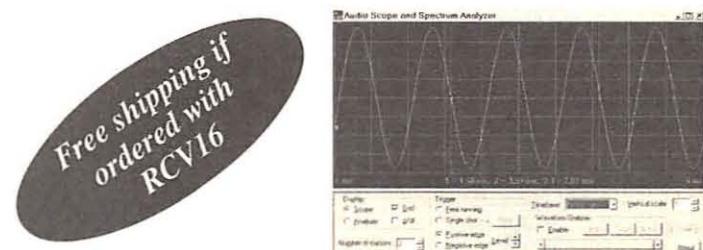
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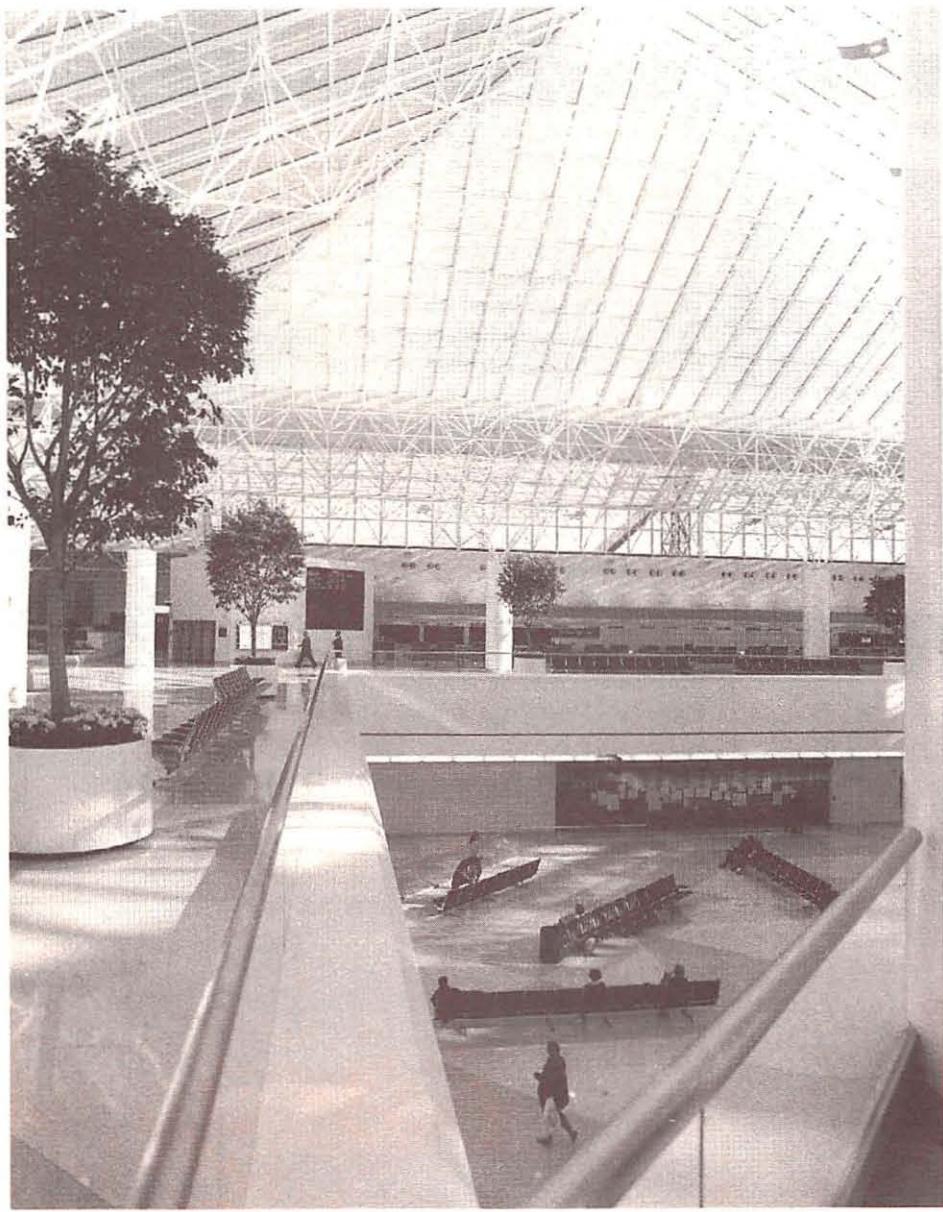
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BWI Airport Technical Data

To tune in to Baltimore Washington International activity, following are the most current frequencies (all in MHz):

Aircraft Frequencies

UNICOM:	122.95
ATIS:	
115.1	127.8
FSS:	
122.1	122.2
GROUND:	
121.9	120.2
TOWER:	
119.4	257.8
APPROACH:	
119.0 (020-100 Degrees)	
119.7 (131-180 Degrees)	

124.55 (101-130 Degrees)
 128.7 (181-019 Degrees)
 228.4 (020-100 Degrees)
 231.6 (131-180 Degrees)
 307.9 (181-019 Degrees)
 325.8 (101-130 Degrees)
 125.3 287.1

DEPARTURE:

128.7
 124.55
 133.75

CLEARANCE: 118.05
 AS ASSIGNED: 325.8

CLASS B:

119.0 (020-100)
 124.55 (101-130)
 128.7 (181-019)
 228.4 (020-100)
 307.9 (181-019)
 325.8 (101-130)

CLASS B IC:

119.7 (131-180)
 231.6 (131-180)

In addition to those above, I've also noted the following unlisted air frequencies used by BWI controllers: 125.525/254.3/265.4/281.6/286.2/304.1.

The Maryland Air National Guard A-10's at nearby Martin State Airport use UHF tower (257.8) and approach (228.4) when working with BWI, while the ANG C-130's use the normal VHF frequencies. BWI provides approach and departure services for these aircraft since Martin State is so close.

The Maryland State Police helicopters generally work on the established tower/approach frequencies. They use 44.74 and 47.66 when communicating with the Medevac System Command control and with State Police road units.

The Anne Arundel County Police aircraft use standard VHF radios to communicate with the airport controllers. However, they use their Motorola 800 MHz trunked hand-held radios when communicating with police road units.

Airline Ground Operations Frequencies

American	129.225
Continental (Maintenance)	129.250
United	129.300
US Air	130.100
Northwest	130.350
Continental	130.400
United	131.075
Continental (Operations)	131.225
Northwest	131.750
Delta	131.850

Other airport frequencies of interest:

Administration Operations	453.8
America West	464.60
Butler Aviation	462.1125
Continental Airlines	460.700/460.750/ 460.875
Delta Airlines	460.675/460.750 460.825/460.850
Henson Aviation, Inc.	463.2625
Icelandair	462.1625
Northwest Airlines	460.650
Trans World Airlines	460.675
US Air	460.700
United Airlines	460.725
American Airlines	461.7875/461.9375 462.8375/463.8375 464.1125/464.6125
Allied Aviation Fuel	151.850

Aeronautical Radio Inc. (ARINC) operates an 800 MHz trunked system which provides administrative communications support to various airport entities.

Non-Aircraft Frequencies

Dept. of Transportation Police 453.90
 Airport Fire/Rescue 154.10/154.98

NOTE: Maryland State Police from the nearby Glen Burnie Barracks (39.04 MHz) and Anne Arundel County Police and Fire (trunked 800 MHz) unit also respond to airport emergencies.

Bearcat Intercepts Trunked Radio



Now...Monitor trunked radio broadcasts

Save big on radio scanners, weather stations, two-way transceivers and more from CEI during our 29th anniversary. To get your free fax-on-demand catalog dial 734-663-8888 from the telephone handset on your fax machine and follow the recorded voice prompts or visit CEI on the web at www.usascan.com. Get many free benefits such as extended warranty coverage on CEI merchandise when you use your Communications Electronics Platinum Plus Master Card® issued by MBNA. No annual fee. Call 1-800-523-7666 anytime and mention offer Q3KI.

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The Weather Monitor II (7440) comes complete with anemometer with 40 feet (12.2 m) of cable, external temperature sensor with 25 feet (7.6 m) of cable, junction box with 8 feet (2.4 m) of cable, AC-power adapter, detailed instruction booklet and one year limited factory warranty.

Now you can be your own weather reporter with the Davis Weather Monitor II. Our top-of-the-line weather station combines the most advanced weather monitoring technologies available into one incredible package. Glance at the display, and see wind direction and wind speed on the compass rose. Ideal for helping plan evacuation orders. Check the barometric trend arrow to see if the pressure is rising or falling. Push a button, and read indoor and outdoor temperature, wind chill, humidity and barometric pressure. Using the Weatherlink with Weather Talker option and your computer, you can issue your own spoken weather reports. Ideal for issuing your own spoken weather reports. Call 734-994-9000 now for live demonstration. Our system can even call you when preset alarm conditions are exceeded. Our package deal includes the new ultra high resolution 1/100 inch or 0.2 mm rain collector part #7852, and the external temperature/humidity sensor, part #7859. Save over \$175 when you order our package deal from CEI. Package deal is order #7440CS-W is \$419.95 plus \$18.00 shipping. If you have a personal computer, when you order the optional Weatherlink computer software for \$134.95, you'll have a powerful computerized weather station at a great price. For the IBM PC running Windows, order part #7862-A. Apple Mac Plus or higher including PowerBook, order part number 7866-A.

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Davis Weather Wizard III 7425-A	\$149.95
Davis Perception II indoor stand-alone weather monitor 7400-A	\$124.95
Davis Weather Talker 7861-A - Call 734-994-9000 for demonstration	\$334.95
Davis Solar Radiation shield 7714-A, helps protect temperature sensor	\$54.95
Davis Remote Display Unit 7815-A	\$84.95
Davis Rain Collector Heater - excellent for winter use 7720-A	\$99.95
Davis Aluminum Rain Collector Shell 7704-A	\$29.95
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Davis Rain Collector II 0.2 mm 7852METRIC-A	\$59.95
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Davis Weatherlink Software for Apple-Versions 3.0 7866-A	\$134.95
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Davis 6-Conductor 40' (12.2 m) extension cable 787804-A	\$21.95
Davis 8-Conductor 100' (30.5 m) junction box cable 7880100-A	\$44.95
Davis Interface Cable Adapter Module 7760-A	\$59.95
Davis Weather-resistant Terminal Box Shelter 7774-A	\$34.95
Davis Electrostatic & RF Protected Junction Box 7740-A	\$39.95
Davis Optically coupled Weatherlink Isolator Kit 7764-A	\$39.95
Davis Grounding Kit, helps protect your station - 7780-A	\$19.95
Davis Bearcat/VR Lighter Power Cord 7873-A	\$9.95
2400 baud modem for Weatherlink MEXT-A	\$29.95
Davis aluminum Sensor Mounting Arm - 7702-A	\$54.95

Radio Transceivers

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Mfg. suggested list price \$515.00/Special \$299.95

Law enforcement and fire departments depend on the RELM MPV32 transceiver for direct two-way communications with their police or fire department, civil defense agency or amateur radio repeater. The MPV32 is our most popular programmable frequency agile five watt, 32 or optional 64 channel handheld transceiver that has built-in CTCSS, which may be programmed for any 39 standard EIA tones. Designed for repeater use. Frequency range 136.000 to 174.000 MHz. The full function, DTMF compatible keypad also allows for DTMF Encode/Decode and programmable ANI. Weighing only 15.5 oz., it features dealer programmable synthesized frequencies either simplex or half duplex in 2.5 KHz. increments. Other features include PC programming and cloning capabilities, scan list, priority channel, selectable scan delay, selectable 5 watt/1 watt power levels, liquid crystal display, time-out timer and much more. When you order the MPV32 from CEI, you'll get a complete package deal including antenna, 700 mA battery (add \$20.00 to substitute a 1000 mA battery), battery charger, belt clip and user operating instructions. Other useful accessories are available. A heavy duty leather carrying case with swivel belt loop part #LCMP is \$49.95; rapid charge battery charger, part #BCMP is \$69.95; speaker/microphone, part #SMMP is \$54.95; extra high capacity 1000 mA ni-cad battery pack, part #BPMP1 is \$79.95; extra 700 mA ni-cad battery pack, part #BPMP7 is \$59.95; cloning cable part #CCMP is \$34.95; PC programming kit, part #PKIT030 is \$224.95. A UHF version with a frequency range of 450-480 MHz, part #MPU32 is \$349.95.

Your RELM radio transceiver is ideal for many different applications since it can be programmed with just a screwdriver and programming instructions in less than ten minutes. Programming is even faster with the optional PC kit. The technician programming instructions part #PIMPV is \$18.00.

TrunkTracking Radios

Bearcat®235XLT-A TrunkTracker

Mfg. suggested list price \$429.95/CEI price \$269.95
300 Channels • 10 banks • Trunk Scan and Scan Lists
Trunk Lockout • Trunk Delay • Extra battery & charger
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Size: 2-1/2" Wide x 1-3/4" Deep x 6" High

Frequency Coverage:
29.000-54.000 MHz., 108-174 MHz., 406-512 MHz., 806-823.995 MHz., 849.0125-868.995 MHz., 894.0125-956.000 MHz.

The Bearcat TrunkTracker BC235XLT, is the world's first scanner capable of tracking a selected radio transmission as it moves across a trunked radio system. Now it's easy to monitor fleets and subfleets in analog trunked radio systems. The BC235XLT can also work as a conventional scanner. This 300-channel, programmable handheld scanner provides scanner users with uninterrupted monitoring capabilities of Type I, II, and hybrid trunking systems. One of the biggest obstacles in the scanner industry has been the increasing use of trunking radio systems in business and public service agencies throughout the U.S. and Canada. This makes it nearly impossible to track a conversation as it moves within a trunk system from frequency to frequency. According to Ken Ascher, WB8LIT, Chairman & CEO of CEI, "the Bearcat 235XLT is a revolutionary breakthrough in scanner technology. Now it's easy to continuously monitor conversations even though the message is switching frequencies." The BC235XLT comes with AC adapter, CRX120 battery charger, two rechargeable long life ni-cad battery packs, belt clip, flexible rubber antenna, earphone, owner's manual and one year limited Uniden warranty. Not compatible with AGEIS, ASTRO, EDACS, ESAS and LTR systems. Call 1-800-USA-SCAN to order your scanner.

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Cobra 2010GTLWX-A SSB CB Base (\$125.00 shipping)	\$299.95
Cobra HH45WX-A Handheld CB radio with weather	\$89.95
Cobra FRS200-A Family Radio Service transceiver	\$89.95
Maxon GMRS210+3-A GMRS transceiver/SPECIAL	\$166.95
RELM RH256NB-A 25 watt VHF mobile transceiver	\$284.95
Sangean ATS909-A portable shortwave receiver	\$229.95

Radio Scanners

Monitor fire, police, weather, marine, medical, aircraft and other transmissions with your Bearcat scanner.

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Save \$45 when you purchase your Bearcat 895XLT or BC235XLT scanner directly from Communications Electronics Inc., P.O. Box 1045, Ann Arbor, MI 48106 USA. Telephone orders accepted. Call 1-800-USA-SCAN. Mention offer TT4. TERMS: Good only in USA & Canada. Only one coupon is redeemable per purchase and only on specified product.

Bearcat®895XLT-A Radio Scanner

Mfg. suggested list price \$729.95/Special \$319.95

300 Channels • 10 banks • Built-in CTCSS • S Meter

Size: 10-1/2" Wide x 7-1/2" Deep x 3-3/8" High

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The Bearcat 895XLT is superb for intercepting trunked communications transmissions (see BC235XLT description) with features like TurboScan™ to search VHF channels at 100 steps per second. This base and mobile scanner is also ideal for intelligence professionals because it has a Signal Strength Meter, RS232C Port to allow computer-control of your scanner via optional hardware and 30 trunking channel indicator annunciators to show you real-time trunking activity for an entire trunking system. Other features include Auto Store - Automatically stores all active frequencies within the specified banks!, Auto Recording - This feature lets you record channel activity from the scanner onto a tape recorder. CTCSS Tone Board (Continuous Tone Control Squelch System) which allows the squelch to be broken during scanning only when a correct CTCSS tone is received. For maximum scanning enjoyment, order the following optional accessories: PS001 Cigarette lighter power cord for temporary operation from your vehicle's cigarette lighter \$14.95; PS002 DC power cord - enables permanent operation from your vehicle's fuse box \$14.95; MB001 Mobile mounting bracket \$14.95; EX711 External speaker with mounting bracket & 10 feet of cable with plug attached \$19.95. Comes with AC adapter, telescopic antenna, owner's manual and one year limited Uniden warranty.

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The EC-130E Command Solo is one-of-a-kind. It is the only airborne broadcast facility in the world with the capability of transmitting on FM, MW, SW, and even in color television. Based in Harrisburg, PA, the 193rd Special Operations Wing of the Pennsylvania Air National Guard has flown the aircraft during every major U.S. military intervention since 1982. Today it broadcasts the two Iraqi National Accord clandestines on MW. (Photo courtesy of Department of Defense)

By Nick Grace

Clandestine radio is a tool that governments use to wage a psychological war against other nations. Sometimes it works, sometimes it doesn't. The United States regularly employs this tactic both to support covert paramilitary operations, such as the 1954 Guatemalan revolution coordinated by the Central Intelligence Agency (CIA), and overt military intervention, including the 1994 campaign in Haiti.

Since 1990, the US has waged a war with broadcasts against Iraqi president Saddam Hussein. For DXers and clandestine radio enthusiasts, this has been a dynamic time full of mystery, intrigue, and excitement. Until now there had been more questions than answers.

■ The Gulf War

Saddam, bold after his victory over neighboring Iran, ruthlessly invaded Kuwait on August 2, 1990, prompting American president George Bush to take decisive action. At stake was the world's oil supply and regional stability in the Middle East. Before the bombing began, Bush and his advisers ordered the



CIA vs. Saddam: The Radio War of the Nineties

CIA and US military into action. These soldiers weren't armed with bullets, however. They were armed with a plane and a radio station: The Voice of the Gulf.

The Voice of the Gulf premiered on Thanksgiving Day 1990 on medium wave aboard the

Pennsylvania Air National Guard's EC-130 aircraft dubbed "Command Solo." Before the plane and station took to the air, however, the CIA along with the Army's 4th Psychological Operations Group quickly organized a group of Kuwaiti exiles and Saudi intelligence officers to produce programming. Shows were recorded from a studio in Riyadh and sent via satellite to Command Solo once it arrived in Saudi Arabia.^[1]

The Voice of the Gulf's purpose was two-fold. First, it aired broadcasts to undermine



"Time is up!" This was one of many leaflets dropped over Kuwait by the CIA to ensure that the Voice of the Gulf programs were having an effect. Hundreds of thousands of Iraqi soldiers surrendered or fled into Iran. (Photo courtesy of Central Intelligence Agency)

the commitment of the Iraqi troops occupying Kuwait by offering medical care and food. Covert air drops of propaganda leaflets warning Stealth bomber attacks helped to strengthen the effectiveness of the station. "Your only safety is across the Saudi Arabian border," one broadcast announced. "That is where the bombing and the starvation stop. The Joint Forces offer you asylum."^[2] Secondly, the Voice of Gulf reinforced the hope of the Kuwaiti people that liberation was soon to come.

On February 27, 1991, Kuwait was indeed liberated and the radio station's utility greatly diminished. The coalition forces fighting Saddam's troops ended the campaign on that day without pushing into Baghdad, but the war of propaganda continued — taking a very interesting turn.

■ The CIA, a PR Firm, and a Clandestine

Later that year, George Bush signed a Presidential Finding ordering the CIA to build an effective opposition group in Iraq that could replace Saddam's regime with a democratic government. With Saddam boxed in by the internationally sanctioned "No Fly Zone" safe havens to protect the Kurds in the north and the Shi'ites in the south, CIA officers scouted the area for Iraqis who could make such an opposition group a reality. They soon found Ahmad Chalabi, an Arab Shi'ite banker with good connections among Iraqi Shi'ites, dissident Sunnis and armed Kurds. Chalabi, they felt, could do the impossible: unite Iraqis under one umbrella.

With a potential leader already recruited, the CIA turned to a renowned public relations firm in Washington, DC, to design and "market" this organization. The Rendon Group was no stranger to this. In fact, this firm had been hired by intelligence officials to spin the public image of the 1989 American invasion of Panama.

Among the first things the Rendon Group did was to give a name to the Iraqi opposition: the Iraqi National Congress (INC). Providing a voice for the INC was also accomplished: The Iraqi Broadcasting Corporation. Internal budget documents within the firm released to the media last year show that nearly \$24 million was spent on INC propaganda between 1991 and 1992, including costs of the radio station.^[3] During its inaugural broadcast on February 15, 1991, the station aired George Bush calling for, in his words, "the Iraqi military and the Iraqi people to take matters into their own hands and force Saddam Hussein, the dictator, to step aside."^[4] His speech echoed through Iraq and bolstered



المؤتمر الوطني العراقي الموحد Iraqi National Congress

The Iraqi National Congress' clandestine built with US taxes, the Iraqi Broadcasting Corporation (Sawt al-Shab al-Iraqi), is audible in North America on 9568.5 kHz at 2030 UTC and in Europe at 1030 UTC. Although a QSL has never been received by the station, reports can be mailed to the INC headquarters in London: 9 Pall Mall Deposit, 124-128 Barlby Road, London W10 6BL, UK. You can visit the INC's homepage, which contains information about this station as well as their slant on current developments: <http://www.inc.org.uk/>

confidence that the INC was the group which could change the nation's future.

The INC's clandestine station broadcast from both its own facilities in northern Iraq and US government transmitters in Kuwait on MW and shortwave frequencies.^[5] Additional transmitters were set up in Jeddah, Saudi Arabia, Amman, Jordan, and Cairo, Egypt, with the assistance of various intelligence agencies.^[6] From 1992 until American support for the group ended in 1995, the Bush and Clinton administrations sent \$4 million annually to keep the station operational "so the CIA could have an Iraqi outlet for the anti-Saddam Hussein propaganda they had spent

all that other money on."^[7]

The Clinton administration, playing partisan politics and losing patience with the INC, lost its confidence with the group in 1995. A covert paramilitary operation was planned for the INC to attack a number of cities in Iraqi Kurdistan, but within hours of its start National Security Adviser Tony Lake cabled Chalabi with the words "You are on your own." The INC and two major Kurdish groups followed through with the operation but were finally decimated by Saddam's forces. The Iraqi Broadcasting Corporation was quickly yanked off of the transmitters in Kuwait, but eventually resumed broadcasts from a site in northern Iraq.

Evidence of the IBC's effectiveness is well known. According to Chalabi, "Through INC broadcasts... the INC is well known inside Iraq and has a large but unorganized following. During the 1996 Atlanta Olympics, the Iraqi Olympic flagbearer defected to the Iraqi National Congress. Before his defection he had never spoken to an INC member — yet from INC radio he was familiar enough with the INC program for a democratic Iraq that within hours he was speaking for the INC on U.S. and international network television."^[8]

■ The CIA, Rebels, and Clandestine Radio

While the CIA built the INC, British intelligence (MI6) constructed their own opposition group in Iraq: the Iraqi National Accord. The Bush administration decided to contribute covert funding for this group as well since it aims to recruit Iraqi military officers and quietly overthrow Saddam.^[9] A revolution coordinated by the INC, on the other hand, would require massive internal support, American air cover, and a long-term military campaign. Although respect for democracy and human rights would probably not be a priority for the Accord, its objectives seemed

The Rendon Group

A GLOBAL STRATEGIC COMMUNICATIONS FIRM

The Rendon Group, located in Washington, DC, was hired by the CIA to build both an Iraqi opposition group and a clandestine radio station from scratch. You can see a history of the firm's previous work, including image-repair for the Kuwaiti royal family during the Gulf War and media consulting for a CIA-backed Panamanian politician in 1989 on their homepage: <http://www.rendon.com/>

to be pragmatic for the American government.

President Clinton continued modest support for the Accord until funding for the INC was discontinued in 1995. Full fledged funding and supervision of the Iraqi National Accord began later that year.

The Accord brought two clandestine stations to life in 1996. On April 21, The Future (al-Mustaql) hit the airwaves from a MW transmitter in Jordan.[10] "This is The Future," an announcer began. "A voice for all the Iraqis confronting oppression and dictatorship, a voice that looks forward to a safe future for a new Iraq." [11] Iraqi Army Radio also began that year from the same broadcast facility. According to various news reports, these stations are recorded in London and sent by satellite to the transmitting site.[12]

The Accord was nearly demolished by an Iraqi invasion of the northern "No Fly Zone" during August and September 1996. Clinton's lack of support for the INC-led military campaign the year before caused tension between two Kurdish groups and led to a battle. Saddam seized upon the opportunity to weaken the northern threat by pushing thousands of troops into Iraqi Kurdistan. CIA officials in territory controlled by the Accord reportedly "ran for their lives." [13] After hundreds of Accord supporters were executed, Jordan dropped its support for the group and the clandestine stations lost a transmitter.

A year later, as Saddam argued with the United Nations over weapons inspections, The Future and Iraqi Army Radio resumed transmissions from the American broadcast facility in Kuwait — the same facility which brought the INC's radio station to life.[14] The Commando Solo aircraft that broadcast the Voice of the Gulf in 1990 was deployed to the Persian Gulf in February, just one week after American officials met with Accord representatives in London, presumably to blanket Iraq with these broadcasts as well.

Ahmad Chalabi was not pleased. During testimony in front of the U.S. Senate in March, he stated, "The INC deplores recent CIA-sponsored radio broadcasts promoting military rule of Iraq. It is not up to the CIA to determine Iraq's leadership..."[15]

■ Birth of an Overt Clandestine

The CIA-run stations and operations within Iraq have made little headway since 1991; therefore political analysts are now focusing on alternative contingencies. One such plan gained popularity at the beginning of 1998 for a new clandestine radio effort by Republican congressmen. The Conservative think-tank



The National Accord is comprised of former Iraqi military officers and encourages troops loyal to Saddam to revolt. Their two clandestines operate on MW from a CIA transmitter in Kuwait and, for the time being, from an American aircraft. The schedule for al-Mustaql (The Future) and Iraqi Army Radio (Sawt al-quwwat al Musallah) is between 1700 and 0700 UTC on frequencies ranging from 1557 to 1584 kHz. If you hear them, you can try writing to their office in London: P.O. Box 3124, London SW19 1RL, UK. The Accord also maintains a webpage at: <http://www.iraq-free.demon.co.uk/>

Heritage Foundation initially proposed the idea of operating a Radio Free Iraq to loosen Saddam's grip on power.[16] By March, Clinton administration officials also supported the idea.

Radio Free Iraq will be overt, fully committing the United States to advance change in Iraq. American commitment through propaganda is cheaper than military intervention, less risky than covert operations, and more effective over the long term. "You can engage tyrants of totalitarian regimes on a day-to-day basis without firing a single shot," presidential hopeful Steve Forbes summarizes.[17] The best example of this tactic is Radio Free Europe (RFE), which played an important role in ending the Cold War by building faith among the anticommunist Eastern Europeans.

If the station becomes a reality, it will fall under the administration of the International Board for Broadcasting, as RFE is, allowing maximum flexibility in its programming and personnel management. Radio Free Iraq will also be manned by INC staff to promote democracy, freedom and human rights. \$4 million has already been allocated to build a Radio Free Iraq; however, it is likely that this money will be used to start a new clandestine aimed at Saddam.[18] We will probably have yet another station to chase after on SW and MW.

■ Conclusion

Covert clandestine broadcasting clearly did not support U.S. policy efforts to overthrow Saddam. The intensity with which the CIA is employing radio propaganda, nevertheless, does reveal how vital clandestine radio remains as a tool and strategy to undermine enemies of state. Any question that these subversive radio stations would disappear after the Cold War can now be answered: Clandestines will always be somewhere on the bands ready to challenge our DXing and QSLing skills.

Nick Grace is a guest lecturer of political science at Muhammadiyah University Malang, Indonesia. Those interested in monitoring the middle east crisis will appreciate the "Showdown with Iraq" website created by Cumbre DX at <http://www.ralabs.com/swl/>

Footnotes

1. Psywarrior
2. ibid
3. Atkinson
4. Bush speech to U.S. Congress as quoted by Jennings
5. Washington Post, March 1, 1998, A17
6. Washington Post, June 26, 1997, A21
7. Jennings
8. Chalabi testimony before the US Senate Foreign Relations Committee, March 2, 1998
9. Stearns
10. Issues, April 1996
11. Accord press release, December 1997
12. San Diego Daily, April 23, 1996
13. New York Times, September 11, 1996
14. Washington Post, March 1, 1998, A17
15. Chalabi testimony before the US Senate Foreign Relations Committee, March 2, 1998
16. Philipps, p.23
17. Associated Press, February 20, 1998
18. Washington Post, March 1, 1998, A17

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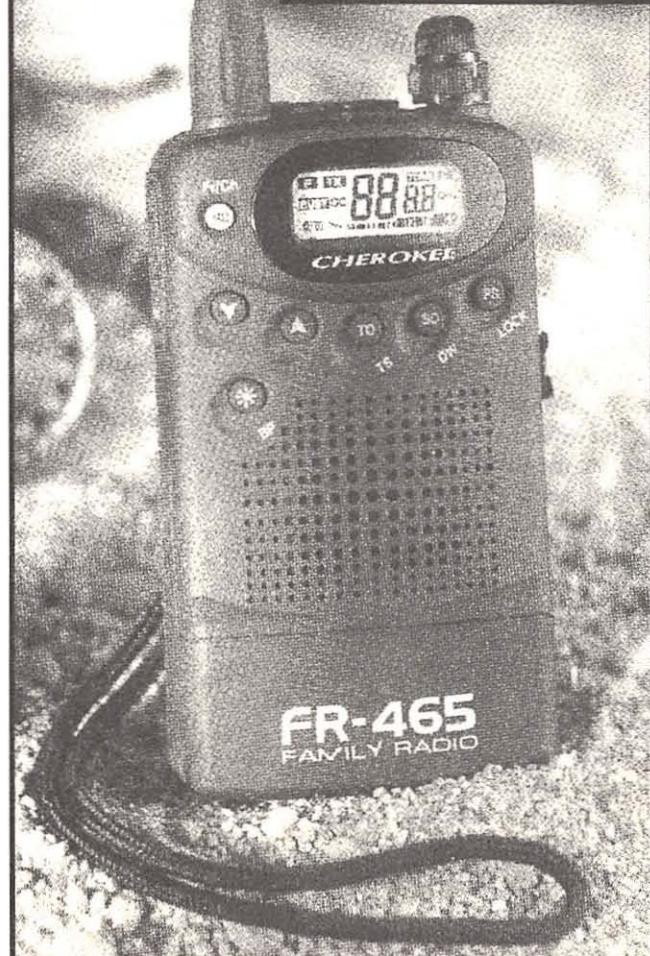
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Oh, Say Can You See?

VORTAC Cuts Through the Haze and Goes the Distance

By Michael Scofield

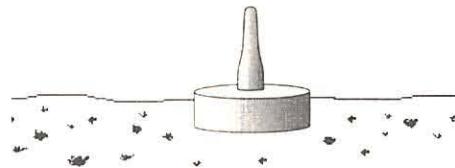
I love mountain tops, especially when it is clear. It is both an emotional and cerebral experience. The cerebral part of me sees a mountain or valley off in the distance, and I want to know what that is. The clearer the day, the more challenging it is to identify a mountain in the distance. In other words, I want to know how far I can see.

Being a radio buff, I know one trick to discovering the distance of the horizon that doesn't depend on whether it's clear or hazy. You can use distant aeronautical navigation beacons whose VHF signals generally propagate only as far as one can see.

There are over 1,300 VOR (VHF omnidirectional range facilities) or VORTAC (VOR combined with TACAN-tactical air navigation system) transmitters scattered across the United States. Almost all of them are operated by the Federal Aviation Administration (FAA), and they generally transmit a complex radio signal on a base frequency somewhere between 108 and 118 MHz.

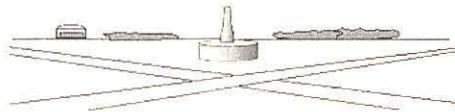
The signal is slightly different in each direction, thus allowing electronics in the cockpit to determine in what direction (or "radial") from that beacon the aircraft is located. Additional equipment allows the plane to interrogate the site to determine its distance from the site. With this combination of direction and distance, the pilot can know exactly where he is in three-dimensional space.

VOR stations have a distinct shape, and because they are generally away from trees or other buildings, they are easy to spot. The most obvious configuration is a small building in a clearing looking like the one above.



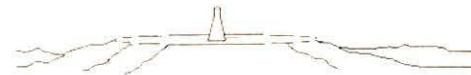
Most VORTAC transmitters have the distinguishing "cone" shaped structure on the top, although not all do. Inside the cone are a set of antenna which construct the distinct signal in each direction. The cone itself is about 15-20 feet tall.

This uniquely shaped building is often sighted in the middle of major airports. You can see it at Washington's National Airport, Oakland, Boston, and in the middle of Chicago's O'Hare.



Some VOR transmitters do not have the TACAN portion to them and lack the top portion of the conical structure. Good examples of this include the one in the middle of San Francisco International Airport.

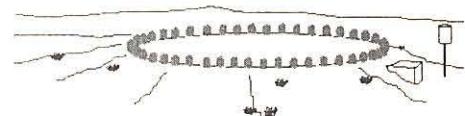
In more remote areas, you may see the cone structure mounted on the ground, on a leveled-off hilltop.



The configuration above is seen in many places in California, including Big Sur, Gaviota, San Marcos Pass, Pomona, and Julian. They generally will house the electronics in a building just off the summit, down a little so

it won't obstruct the propagation of the signal in all directions. Indeed, VORTACs cannot be placed too close to buildings which may either obstruct or reflect the signal and hence give off erroneous signals.

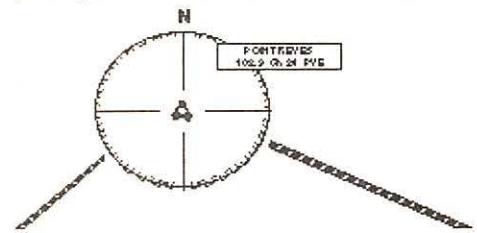
A second antenna design for the VOR is a circle of little red domes. This is a common configuration on some gentle hilltops (such as on the dunes near Van Nuys). Usually just down the slope in some direction is a building containing the electronics. Where a TACAN antenna is also required at this site, it is usually set off a few yards to the side.



On most aeronautical charts, the VORTAC is usually designated by a symbol (right), with a compass rose around it and the letter "N" indicating magnetic north. A small box attached or nearby indicates the name of the beacon, the frequency, and the three-character symbol for it (which you can hear in Morse code).

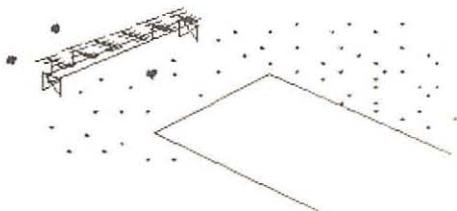


Aeronautical flight paths often radiate off from the VORTAC, and indeed, many flight paths go from VORTAC to VORTAC.



■ Localizers

Sharing the 108-118 MHz band are runway localizers. These are narrow beams of a radio signal guiding aircraft down the center line of a runway. The antennae themselves are generally located at the far end of the runway they serve. Other antennae nearby provide distance-measuring signals.



Localizers are often found in pairs at each end of a major runway. On the instrument flight rule (IFR) charts, such a runway would appear as shown below. This map also shows an outer marker on the localizer at the right.



On airports where the prevailing wind is generally in one direction, there is only one localizer. Localizers generally have a Morse code identifier of four characters, the first being an "T".

■ Picking up the signals

Many scanners manufactured recently include the 108-118 MHz range. The signal from the VOR transmitter usually has a clicking sound, with an occasional Morse code identification.

It helps to have a larger antenna (a telescoping whip, for example) than the "rubber duck" which comes with most scanners. And I find that the VOR and localizer signals are horizontally polarized (unlike the air traffic control signals), so one must hold the radio sideways. You may look a bit silly, but no one's likely to see you: there are few crowds on the mountain tops we're headed for.

■ A modest contest

With that introduction, I can now describe a pursuit I have (a contest, of sorts, if anyone else is crazy enough to pursue it), of seeing how many VOR and localizer signals I can hear from one point on the surface of the earth. Obviously, a jet flying at 35,000 feet over West Virginia can probably pick up well over 100 VOR signals from a radius of 250 miles in

any direction. But being earth-bound as I am and of limited budget, I must find a mountain top which will afford me a suitable "view."

Four points in southern California have yielded a good list of signals. But to establish an unbreakable record, it's likely I shall have to go to Northern California, either to Mount Diablo (east of Oakland) or to Mount Hamilton (southeast of San Jose).

One problem, of course, is the intense radio signals which one often finds on the highest and best mountain sites. One may have to walk around the mountain, perhaps 100 yards away from some of the transmitters, to get the scanner to be sufficiently sensitive to the faint and distant VOR signals.

What follows are a few of the sites in southern California which I have found fruitful.

■ Mt. Vicente

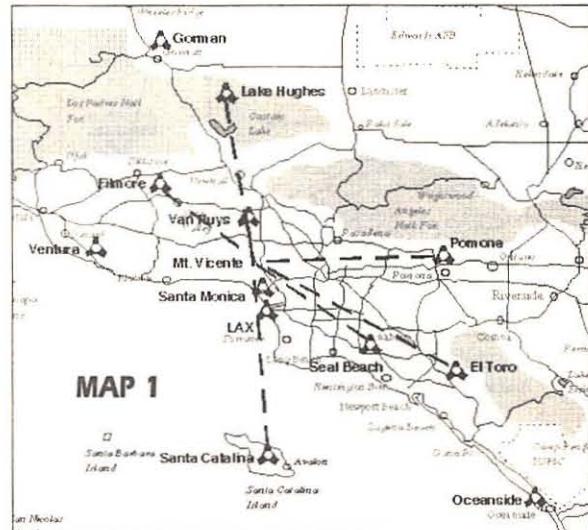
Mt. Vicente is one of the highest points on Mulholland Drive which runs along the crest of the Santa Monica Mountains between Hollywood and Topanga Canyon. The peak—originally a radar site for Nike missiles—has now been restored into a park by a conservationist organization. (See Map 1)

The last mile is rough dirt road, but if you drive slow, you can make it. This was one of the first sites I used, and it proved fruitful with nine VORs audible.

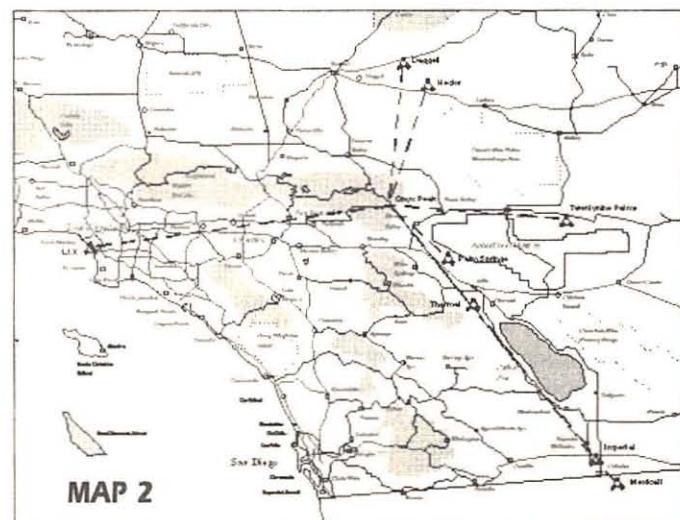
I could not pick up the Ventura VOR; too many high mountains (such as Castro Peak) were between us. I did, however, pick up localizers at Van Nuys and Burbank.

■ Onyx Peak

This 9,114 ft. mountain dominates the eastern end of the San Bernardino range. To the east or northeast nothing comes close to its height. It has a clear view over much of the Mojave Desert. But using the VOR signals, I discovered it has a "view" far down the Coachella and Imperial Valleys, all the way to Mexicali. (See Map 2).



Onyx Peak doesn't have easy access. The road to the summit is blocked by a gate, but a 2-mile hike will get you there. The mountain has quite a few electronic sites on it, so one has to move away from them for the scanner



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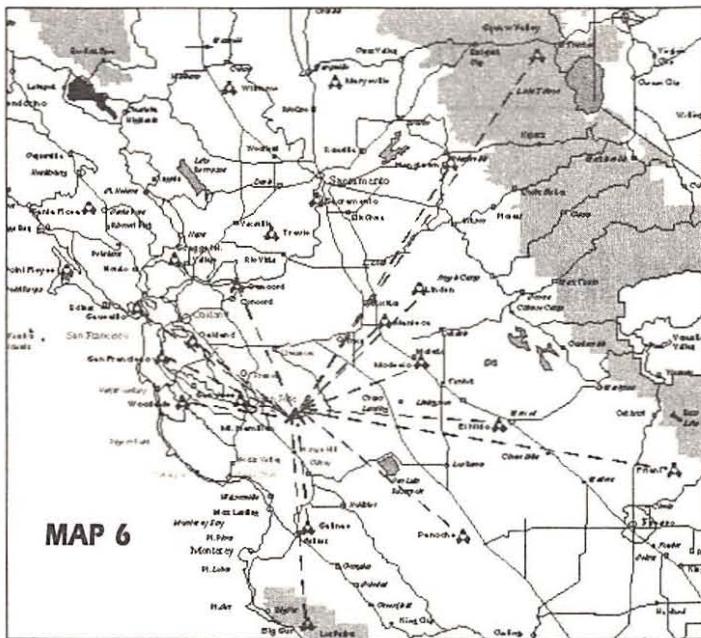
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MAP 6

and every house in Marin County. To the southwest, the giant blimp hangar at Moffett Field, and the peak of Loma Prieta south of San Jose. To the due south, I could see the domes on Mt. Hamilton. (See Map 6).

I heard a number of VOR's from the top, but was surprised not to hear some from the northern Sacramento valley. I couldn't get Williams, Maxwell, or Marysville. This may be partly because there is so much RF interference from the FM broadcast stations on the peak.

But I was pleased to pick up the Pt. Reyes VOR which is on the top of a ridge. I could not, however, hear El Nido, or Panoche (which had a ridge between us).

All in all, even with fourteen logs, the radio reception at Mt. Diablo was a bit of a disappointment, primarily because of the radio interference. Visually, it was spectacular!

■ Mt. Hamilton is a Winner

I suspected this mountain peak would give me the most VOR signals. This 4,209 ft. peak is about 15 miles east of San Jose, and the white dome of the famous Lick Observatory is clearly visible from much of the west San Francisco bay area.

The road to the top is not for the faint-hearted. It is narrow and winding, in places reduced to a 30-ft. turning radius. It is paved all the way, but must be driven quite slowly in places because of the tightness of the turns. (See Map 6).

At the top of Mt. Hamilton are a number of telescope facilities. The original observatory building is open to the public from 1:00 to 5:00 most afternoons, and contains the original 24-inch refractor telescope built in 1888.

From the top of the peak, I got some

interference from FM broadcast stations, although not as severe as that encountered on Mt. Diablo to the north. There appear to be no such FM or TV broadcast transmitters on this peak, although there are a few utility stations at the east end of the ridge.

I was very pleased with the total of 16 VOR signals, and an additional six runway localizer signals. Airports with localizers included San Francisco International (both runways 28-left and 28-right), the San Jose runways, Hayward, and Oakland.

As expected, I successfully heard a number of VOR signals in the Bay area. Similarly, some VOR's in the central valley were to be expected. Hangtown (the VOR at the Placerville airport) was a pleasant surprise. And Salinas was to be expected.

To the south, I had hoped to hear the Big Sur VORTAC which is a good distance down the coast, but atop a ridge overlooking the Pacific. It came through quite clearly, as did the Panoche VOR down the Diablo range to the southeast. I was surprised and quite pleased to hear the Friant VORTAC located on a ridge north of Fresno. I had heard this one from Mt. Abel to the south.

I was, however, totally surprised to hear a weak but discernible signal from the Squaw Valley VORTAC up in the high Sierras near Lake Tahoe. Indeed, not thinking I could hear that far, when I noted the frequency (113.2 MHz.) and the last two characters of the Morse Code identifier (somewhat obscured by the voice HIWAS broadcast riding on the same carrier), I initially didn't look that far east on my aeronautical chart to find it.

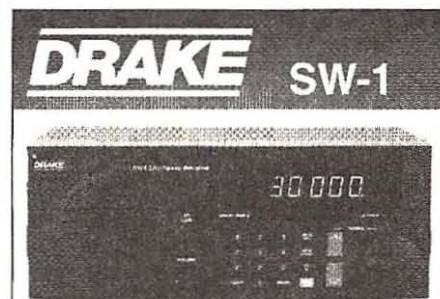
I expected to pick up Pt. Reyes, because two years ago, I could clearly see Mt. Hamilton from the Pt. Reyes lighthouse on an unusually clear day. But while the Pt. Reyes VOR is up on a ridge, it may be shielded by Mt. Tamalpais. Similarly, I didn't hear the Scaggs Island VORTAC as I expected to. Again, it may have been shielded by the Oakland hills. But then, I could hear the Concord VOR, which was a total surprise given the terrain between.

I tried for several VORs which I had hoped

to hear (Mendocino, Pt. Reyes, Scaggs Island, Sacramento, Clovis, and Marysville) but could verify nothing above the noise. So they don't go into the log.

Even so, 16 VOR's and 6 localizers is rather phenomenal, and I doubt if any other point on the surface of the earth (in the United States, at least) will yield that many signals.

I think I have a record. Should I contact Guinness?



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The New Band in Town

As we all know, the federal government has directed the FCC to auction off portions of the spectrum to help balance the budget and provide additional monies to fund Social Security and other programs. The fact that many high-bidders for spectrum have recently defaulted on their obligations to Washington has not, apparently, dissuaded legislators from taking the position that the sale of the ether can be their manna from heaven.

During the New York City World Trade Center tragedy, in which a terrorist group bombed the garage of the building in an attempt to topple one of the towers, police, fire, and EMS units found that they could not communicate with officials from other agencies such as the Port Authority as well as the state and federal authorities that responded. Representatives from the various groups argued to Congress and the Commission that there was not enough spectrum available to allow for seamless public safety communications with easy interoperability.



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This initiative, which was supported by the numerous radio groups such as the Association of Public Safety Communications (APCO) and the International Municipal Signal Association (IMSA), as well as two-way manufacturers, could not have been better timed. By backing the movement, government could demonstrate a crying need for additional spectrum and, at the same time, auction off pieces of that spectrum to commercial users.

How could they pull that off? Call it the fault of technology. Full- and half-duplex systems require base and mobile frequencies. Since most of the available spectrum is near the top end of the scale, greater separation between input and output channels is required. This is why there are 45 MHz between the base and mobile units on 800 MHz trunked public safety and cellular systems. According to the manufacturers, there would be an extremely heavy price to pay in filtering should the channels be much closer together (although at 900 MHz the spacing is 39 MHz).

Therefore, as the government worked to grant input and output channels to public safety, they noticed they could nicely slot commercial users in between (this is pure conjecture). And, voilà, they have their commercial spectrum to auction.

As all of this was occurring, the government was continuing its push toward the future of television transmission schemes, HDTV (High Definition Television) or DTV (Digital Television). As we understand it, with digitally compressed signalling techniques, broadcasters can pump more signal down a narrower path, thus freeing up



spectrum. So, where did the FCC look for more spectrum, spectrum that had to be near existing public safety channels in order not to require mature systems to move and save the expense of dual-band equipment? Naturally at the top-end of the UHFTV channel plan, just below the input side to 800 MHz conventional and trunked systems: TV channels 60-69.

Television broadcasters, who have had a free ride up until now, have fought to retain their mammoth amount of spectrum (512 to 806 MHz for UHF alone!) and, despite their mega-profits, have naturally been disinclined to pay for the ultimate bandwidth. This FCC action moves broadcasters closer to the day when, if they expect to keep their special status, will at least have to trade off a good deal of their spectrum. The following are a few brief, and most important, snippets from the FCC report on this new scanner band we'll call "700 MHz." You can read the full report at http://www.fcc.gov/Bureaus/Engineering_Technology/Orders/1997/fcc97421.txt

INTRODUCTION. By this action, we (the FCC) are reallocating the 746-806 MHz band, currently comprising television (TV) channels 60-69. As mandated by the Balanced Budget Act of 1997, we are allocating 24 MHz, at 764-776 MHz and 794-806 MHz, on a primary basis to the fixed and mobile services, and designating this spectrum for public safety use. This allocation will help meet the need of public safety to ensure interoperable communications among various public safety organizations, provide for growth of existing systems, and accommodate new types of services that will strengthen and enhance public safety.

As further mandated by the Budget Act, we are allocating the remaining 36 MHz at 746-764 MHz and 776-794 MHz on a primary basis to the fixed, mobile, and new broadcasting services for commercial use. Licenses in this 36 MHz of spectrum will be assigned through competitive bidding in accordance with procedures that will be determined in a later proceeding. This 36 MHz of spectrum can be used to make new technologies and services available to the American public. These proposals are an outgrowth of our digital television (DTV) transition plan.

DISCUSSION. In the Notice, we observed that increased dependence upon radio communications by public safety agencies has led to a shortage of spectrum available for public safety communications. Because the 794-806 MHz band is subjacent to existing public safety operations in the 806-824 MHz band, it holds the best potential for expansion of and interoperability with existing systems. The close proximity to existing spectrum used for public safety could also reduce the difficulty and cost of designing equipment. Further, most public safety communications systems require some minimum separation between the receive and transmit frequencies, for technical reasons. We tentatively found that a separation of 30 MHz is adequate for public safety systems.

COMMENTS. Commenters representing public safety agencies, radio equipment manufacturers, and many states, counties, and municipalities strongly supported reallocating 24 MHz of channels 60-69 for public safety use. For example, the Association of Public-Safety Communications Officials-International (APCO) states that Congress, the Administration, and the Commission itself have recognized the substantial need to reallocate additional spectrum to public safety. APCO stresses that the reallocation of 24 MHz from the 746-806 MHz band will address a significant portion of public safety spectrum needs.

The State of California applauds the speed with which we have moved to satisfy public safety spectrum needs, citing its own report which identifies several spectrum related deficiencies in its ability to meet the needs of state agencies.

The Land Mobile Communications Council (LMCC) concurs with our proposal to allocate spectrum for public safety services, stating that additional public safety spectrum would help mitigate current spectrum overcrowding, enhance interoperability among public safety agencies, and allow the development of cost effective advanced communications systems.

What does this all mean for scanner manufacturers? It's very simple: Customers who had purchased very wide-band high-end scanners, such as the ICOM series, with full spectrum coverage from 25-1300 MHz (less cellular, of course), should be okay. All other hobbyists will be out of luck if a nearby agency happens to license this band.

Unclear at the moment is what transmission scheme will be used by public safety agencies in their new slice of spectrum. Presumably the band will be used by trunking systems, and, increasingly, by digital trunked systems, probably with 12.5 kHz spacing (and eventually 6.25 kHz spacing), as opposed to the standard 25 kHz. How this is addressed by the manufacturers and software developers is a topic for another article. (We're also not 100 percent sure which side will be the input and which the output.)

In practice, the scanner manufacturers may find the opening of 700 MHz to be an opportunity similar to the addition of 800 MHz some 15 or 20 years ago. Ever since the Bristol, Connecticut, police (which we believe was the very first 800 MHz public safety agency) switched bands, Uniden and Radio Shack have charged a premium for a scanner incorporating these high frequencies (just as they did, for a short while, when the UHF "T-Band" was first introduced). The two titans of scanning, hopefully, will eventually offer scanners with 700 MHz. If customers are asked to once again cough-up a small premium for it, then so be it.

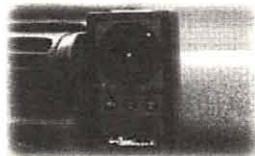
■ The Bill Goes On

H.R. 2369, The Wireless Privacy Enhancement Act of 1998, may soon become law. In February, the bill quickly moved through the House Commerce Committee on a voice vote and, as expected, was sent to the House floor with no further amendments. On Thursday, March 5th, the bill was placed before the House of Representatives for consideration. We understand that there was a short "debate" between Billy Tauzin (R, LA) who introduced the bill, discussing it for the

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record with Rep. Markey (D, MA) who co-sponsored it.

If there was a "debate," it was likely more of a pat-on-the-back session between the two, as well as a "colloquy" in which statements are read into the record concerning the purported goals and consequences of the Act. We understand this language can be used in court cases to demonstrate, for one side or the other, the actual desired effects of the bill the legislators had in mind it was penned. (This editor has ordered a copy of the tape of the House debate and of Billy Tauzin's C-SPAN roundtable discussion the morning of the vote. If there is anything interesting to report, you'll read about it later this year.)

As we've discussed many times in these pages, H.R. 2369 is not a bill we wanted. There are still deleterious issues that the legislation raises, most particularly the matter of decoding public safety digital transmissions. Many also continue to argue that there should be no monitoring restrictions whatsoever. They believe that, if Congress wishes to write a law, it should be one that requires cellular and PCS providers to encrypt, and guarantee the security of, their customers' transmissions. This editor won't bore you with the counter-arguments again other than to say it's not political reality.

H.R. 2369 passed the House 414 to 1. (The one dissenting voice came from Ron Paul, a Texas Republican representative from Texas, perhaps the Ft. Worth area... You can figure that one out.)

Those who voiced the opinion that the airwaves should remain completely free were dismissed as laughingstocks or who had no understanding of how Washington works. H.R. 2369 requires scanner manufacturers to remove cellular and PCS frequencies from their scanners. This may mean that we'll lose narrowband PCS frequencies from 901-902 MHz, from 930-931 or 932 MHz, and from 940-941 MHz, as well as wide-band PCS from 1850-1990 MHz. All in all, this is not much of a loss, especially considering the original language of the bill which would have meant the end of our hobby, many jobs, and a terrible loss of freedom.

A "Section-by-Section Analysis of the Legislation," provided to me by attorneys working for the House Commerce Staff, sheds increased light on the intentions of H.R. 2369. Here are some of the more critical passages of this Report, which may not have represented the final version to be read into the record:

"Section 2(a) extends the prohibition in section 302(b) of the Communications Act of 1934 on manufacturing, selling, etc., scanning devices to modifying as well. While the Committee believes that this is already covered by existing law, it has decided to make the prohibition explicit to prevent any misreading of the statute." (No comment necessary.)

This section is perhaps the most interesting and controversial: "Section 2(b) makes amendment to section 302(d) of the Communications Act of 1934. Section 2(b) amends section 302(d)(1) to expand the scope to new communications technologies such as personal communications services (PCS), and protected specialized mobile radio and paging services. It also requires the Commission to deny equipment authorization to scanners that are capable of being equipped with certain decoders.

"By this language, the Committee does not intend to hamper the inclusion of consumer-friendly features on radio scanners such as earplug jacks or other ports. But the Committee intends manufacturers now to design scanners with ports that cannot be used to equip the scanner with a decoder that can convert digital cellular, personal communications services, protected specialized mobile radio services to analog voice audio; or convert protected paging services to

alphanumeric text; or otherwise decrypt radio transmissions for the purposes of unauthorized transmissions. (Editor: Reception must be the intended last word instead of 'transmission.') Thus, manufacturers, after the enactment of the Wireless Privacy Enhancement Act, will be under an obligation to ensure that consumer-friendly features cannot be used to equip scanners with such prohibited decoders."

The document then goes on to discuss how the FCC, with the passage of this Act, now has the authority to prescribe rules to enhance the privacy of "users of frequencies shared by commercial services and the public safety community."

The FCC will also consider rules and regulations requiring "that scanning receivers be manufactured in a manner that prevents any tampering or alteration by the user that would permit the device to be used unlawfully for interception or divulgence of radio communications." We may actually see warning labels on scanners in the future. The manufacturers are provided sufficient time to sell off their current inventory.

While the entire Report is of great interest, the last bit of language which directly affects our ability to scan legally is found in section three: "Section 3(a)(4) preserves the authorization of certain interceptions or disclosures provided in Chapter 119 of Title 18. That chapter governs wire and electronic communications interception and interception of oral communications. Section 2511(g) provides a number of exceptions for the interception to the chapter's prohibitions on interception. The majority of these exceptions relate to government interceptions. However, Section 2511(g) provides a number of broad exceptions for the interception by private parties of radiocommunications, including those that are transmitted over a) a system that is configured for ready access by the general public; b) by any station for the use of the general public, or that relates to ships, aircraft, vehicles or persons in distress; c) any governmental, law enforcement, civil defense, private land mobile, or public safety communications system that is readily accessible to the general public; d) by a station operating in the amateur, citizen's band (CB); and e) by any marine or aeronautical communications system.

"Because the Committee preserved the Chapter 119 exceptions in its amendment of Section 705(a) of the Communications Act, the Committee does not intend for the Commission or any other enforcement agency to investigate or fine parties for the interceptions authorized by Chapter 119. Therefore, the Committee does not intend for uses of scanning receivers and receiving radios such as shortwave radios, that are consistent with the Section 2511(g) exceptions to be investigated or fined under Section 705(a)."

We shouldn't need to spend too much more time discussing H.R. 2369. Although the Senate has yet to act upon the Bill, it is generally considered noncontroversial and is likely to be voted on without discussion. The next time you'll probably read about it on these pages is when President Clinton signs it into law. I'll leave you with this: It all could have been a helluva lot worse.

■ Final Notes

Trunkcom, the list server dedicated to the exchange of trunking-related information, is moving (or perhaps already has moved) to another home. We gratefully thank Grove Enterprises for freely hosting Trunkcom since its inception. You will be able to find details on our move at the www.grove.net web site. As always, a special note of thanks goes out to list administrator John McColman, without whom the list would be in chaos.

Note to U.S. consumers only: It is unlawful to import, manufacture, or market cellular-capable or cellular-restorable scanners into the U.S.



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5640	100-C 11	401111	1 300-0-372		
1911	600-B 10	501111	1 300-0-372		
2000	100-C 121	521111	1 300-0-372		
111111	200-B 120	1100-1-10	1 300-0-372		
2000	100-C 121	211111	1 300-0-372		
344	111111	321111	1 300-0-372		
1610	200-B 120	521111	1 300-0-372		
2000	100-C 121	531111	1 300-0-372		
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We've Got Your Numbers

Recent tensions in Iraq have apparently caused an increase in HF "numbers" broadcasts. Nowhere is this more dramatic than on those three-letter-ID stations reputedly operated by Israel's controversial spy agency, the Mossad.

This formidable organization, whose name translates as "Institute," is a combined secret police and intelligence group. It's been given a sweeping mandate to counter military and terrorist threats, both foreign and domestic. Operations are covert, often bold, and sometimes bloody.

Mossad was established in 1951 by then-Prime Minister David Ben Gurion. Its Director General, sometimes known as "S," still reports only to the PM and defense secretary. They've been in the news of late, following a botched assassination plot, and an uproar which nearly brought down Israel's government.

For some years, Mossad has been linked to an especially loud and bizarre set of HF "numbers" transmissions. "Numbers," in radiospeak, are stations that broadcast long strings of digits and letters in groups, perhaps as coded messages. At any time of day, there's probably a numbers transmission going somewhere.

Modern numbers, as we know them, started during the Cold War. Many assumed that they'd end with it. They didn't. In their utter strangeness, they remain as compelling as ever.

For a generation, these signals have been tracked, located, and analyzed for any technical clues at all. Traffic has been crunched, correlated, and attacked with every statistical tool known. Authors, often with entertaining pseudonyms such as "Havana Moon," have come and gone.

What is the result of all this work? Absolutely nothing. We have suspicions, some evidence, some spy stories, but no hard facts. The people who know are still not telling.

It's especially interesting that numbers stations go out of their way to get noticed. No spy-movie stealth for these guys. They're running serious power, hammer-down power, grab-the-channel power, wattage to your cottage. Some, in addition, send hours of

carriers, or play music, or count to ten. Are they merely a colossal diversion, an expensive disinformation, or a guaranteed minimum noise to foil traffic analysis? Or are they control messages for grunt-level informers, ordinary folks recruited or blackmailed by real spies, who listen on inconspicuous, consumer radios and use easily concealed one-time code pads?

We don't know. Nor are we about to know.

Getting back to Mossad, one especially striking logsheet came from Takashi Yamaguchi, of Nagasaki, Japan. He heard a lot of numbers stations, representative of the type we're talking about here. This month's column contains a list of his and other loggings.

Mossad's five-number, phonetic, English language format is distinctive. It's also rather captivating in its sheer weirdness, making no attempt whatsoever to explain itself to anyone.

Broadcasts are in a female voice, using standard phonetics, always in AM or USB. There's a mechanical sound, as with most of these stations. They're probably using digitized words, phone company style. For some reason, there's often a French accent. If "she" says the phonetic "N" as "Novembair," you have a dead giveaway.

They begin on the hour or quarter-hour, with lengthy repetition of what is probably a callsign or identifier. These are always three letters, usually postended by the number two. Most of the time, it's followed by a string of phonetic, five-letter groups.

Parallel transmissions on two or more frequencies are common. It's very productive to keep a log of Mossad stations, as times and frequencies don't change much.

I have always hoped that the radio engineers for these various intelligence groups get a chuckle reading all our theories in the shortwave press. I certainly enjoy writing about them.

■ Quick corrections

In the March Utility World, the frequency for marine bulletins from Coast Guard groups

was given as 2760 kHz. Well, I transposed digits. The real frequency, of course, is 2670, and it's as active as ever.

Some people may not be hearing the double ticks mentioned in the April WWV column. This is because, for the first time in a while, there aren't any! I suspect that UTC has drifted into close sync with UT1, but this never lasts.

■ Recent Mossad Numbers Loggings

kHz	ID	Time	By	Simulcasts or Comments
2270	SYN 2	2200	Y	JSR usually heard here
2626	MIW 2	2215	Y	
2743	ULX	2300	B	
2953	KPA 2	1815	Y	
3150	PCD	1800	B	
3150	PCD	1800	B	
3152	PCD	1800	Y	4270
3270	MIW 2	1415	Y	6370
3270	SYN 2	1745	Y	5267
3417	ART	1930	Y	5437
3640	MIW 2	0119	R	
3840	Unk	2245	B	Joined in progress
3840	YHF	1730	Y	
4270	PCD	1800	Y	3152
4360	SYN 2	1945	Y	5630
4360	SYN 2	2145	Y	5629
4463	FTJ	1730	B	Heavy jamming
4463	FTJ	2158	B	
4665	VLB 2	1545	Y	Interference to Pacific air control
4880	ULX	2200	B	
5091	JSR	1831	R	
5230	CIO 2	1848	R	
5267	SYN 2	1745	Y	3270
5437	ART	1930	Y	3417; freq is usually 5435
5629	SYN 2	1945	Y	
5630	SYN 2	2145	Y	4360
5820	YHF	1400	Y	7918
6270	ULX	1440	Y	
6370	KPA 2	1405	Y	ID only, repeated for 1+ hr
6370	MIW 2	1415	Y	3270
6498	PCD 2	1400	Y	
6500	PCD	1500	Y	Very strong
6658	MIW 2	1415	Y	
6658	VLB 2	1245	Y	
6745	VLB 2	1245	Y	
6840	EZI	1800	B	Again at 2000
6840	EZI 2	1600	B	9130
7445	SYN 2	1345	Y	5629
7918	YHF	1400	Y	5820
9130	EZI 2	1600	B	6840, again 2100
10352	CIO 2	1445	B	
11565	EZI	1430	Y	13533
13533	EZI	1430	Y	11565

B Ary Boender, Holland
 R Alf Rosenstock, WUN News
 Y Takashi Yamaguchi, Japan

Hugh Stegman

Abbreviations used in this column

75/150	RTTY speed/shift (varies)	MFA	Ministry of Foreign Affairs
AB	Air Base	NASA	National Aeronautics and Space Administration
AF	Air Force	NORAD	North American Aerospace Defense Command
AFB	Air Force Base	PACTOR	Teleprinter system combining characteristics of packet radio and SITOR
AM	Amplitude modulation	RAF	Royal Air Force (U.K.)
ANDVT	Advanced Narrowband Digital Voice Terminal	RTTY	Radio Teletype
ARQ	Automatic Repeat Request (an RTTY mode)	RY	RTTY test (from traditional RYRYRY...)
ARRS	Aerospace Rescue and Recovery Service	SAM	Special Air Mission (USAF VIPs)
CG	Coast Guard	SHARES	Shared Resources (US Government)
CP	Command Post	SITOR	Simplex Telex Over Radio
CQ	General call: Hello all stations	Unid	Unidentified transmission
CW	Continuous Wave (Morse code)	USAF	U.S. Air Force
DoD	Department of Defense	VIP	Very Important Person
DSN	Defense Switched Network (formerly AUTOVON)	VNA	Vietnam News Agency
EAM	Emergency Action Message	VOLMET	"Flying Weather" (from French)
FEC	Forward Error Correction (an RTTY mode)		
GHFS	Global High Frequency System		

All transmissions are USB (upper sideband) unless otherwise indicated. All frequencies are in kHz (kilohertz) and all times are UTC (Coordinated Universal Time).

60.0	MSF-Teddington time signals, from UK in CW, at 1245. (Ary Boender, Netherlands)
75.0	HBG-Swiss Observatoire Neuchatel time signals, in CW at 1246. (Boender, Netherlands)
77.5	DCF 77, German PTB time signals in CW at 1232. (Boender, Netherlands)
2840.7	DLVK-ZB <i>Hiddensee</i> , German customs launch with position report for Coast Guard Neustadt. SITOR-A (100 baud), at 1639. (Boender-Netherlands)
2941.0	Moscow Volmet, flying weather at 2244. (Boender-Netherlands)
3084.0	Unid-Female 5-figure numbers in Chinese, LSB at 1435. (Takashi Yamaguchi-Japan)
3196.9	Orange 400 and 430-Possible US Navy, working something sounding like, "Superior Valley Tower," mentioned "Alameda" and "taxi runway 090," at 0145. (Paul Bunyan-MO)
3756.0	Unid-"The Pip," station that makes CW pips in 80 meter amateur band, around for years, at 0048. (Boender-Netherlands)
4077.0	RMP-Russian Navy, Kaliningrad, CW weather at 1719. (Boender-Netherlands)
4398.0	YQI-Constanta Radio, Romania, working unid vessel at 1728. (Boender-Netherlands)
4482.0	Unid-Russian Man "numbers" in AM at 2210. (Boender-Netherlands)
4485.0	Unid-Czech Lady "numbers," also 5027, several days at 1355. (Boender-Netherlands)
4507.0	Unid-Spanish 5-figure "numbers" in AM, at 1102. (Bunyan-MO)
4594.0	Golf Kilo-German language, 5-figure "numbers" broadcast at 2230. (Boender-Netherlands)
4601.5	OA-Dublin, Navy station with routine messages in SITOR-A at 1732. (Boender-Netherlands)
4745.0	Teardrop-USA, calling Nightwatch 01 at 1625. Also 5026. (Jeff Haverlah-Texas)
5190.0	<i>Liberty Star</i> -NASA Booster Recovery Vessel, working Cape Radio at 2308, went to 3365. (Bunyan-MO) <i>Usually recovery of spent space shuttle boosters. -Hugh</i>
5266.0	HEP5-Kantonspolizei Zuerich, with CW VVV marker, at 1144. (Boender-Netherlands)
5391.0	B80-Royal Navy, UK, in exercise with C-0-P, at 1424. (Boender-Netherlands)

5403.0	Unid-RAF, Buchan, radio check with E-9-I, at 1407. (Boender-Netherlands)
5422.0	Unid-Lincolnshire Poacher, numbers, at 1700. Also 6485 and 8464. (Yamaguchi-Japan)
5429.5	Air Force Two, working Andrews AFB at 0727. (Bunyan-MO)
5598.0	Air Force One-SAM 28000, position report for unknown station at 0041. Alitalia 4361, possibly the Pope leaving Cuba, working New York Radio at 0405. (Bunyan-MO)
5687.0	DHM 91-German AF, Muenster, working unid aircraft at 1422. (Boender-Netherlands)
5714.0	Architect-RAF, Upavon, UK, with "celebrity" broadcast at 1132. (Boender-Netherlands)
5914.7	KAWN-USCG, Saddlebunch Key, with coded weather, in RTTY (75/850), at 0604. (Bob Hall-RSA)
6255.0	Unid-Spanish female 5-figure numbers, at 0410. (Bunyan-MO)
6485.0	Unid-Lincolnshire Poacher numbers at 1600. Also 6655, 10426. (Yamaguchi-Japan)
6493.5	LYL-Klaipeda Radio, Lithuania, with CW navigation warnings at 2206. (Boender-Netherlands)
6502.0	TBB 6-Turkish Navy, Ankara, calling TBDJ in CW at 2202. (Boender-Netherlands)
6712.0	Offutt-USAF GHFS, Nebraska, EAM at 0656. (Haverlah-Texas)
6739.0	Offutt-USAF GHFS, Nebraska, EAM at 1504. Concourse working Nightwatch 01, moving to Z175 at 2131. (Haverlah-Texas)
6751.0	Unid-USAF with relay of Nebraska football game from a local FM station, 2015 through 2255. (Bunyan-MO)
6779.0	DHJ 59-German Navy, Wilhelmshaven, working unknown vessel in baudot RTTY and USB, at 2153. (Boender-Netherlands)
6802.0	Unid-Spanish 3/2-figure "numbers" in full-carrier USB, at 0304. (Bunyan-MO) <i>Usually mode R3E. -Hugh</i>
6817.0	SAM 60201 and 60202-USAFAF VIP aircraft, radio checks with Andy on F-709, at 1512. (Bunyan-MO)
6826.0	Unid-Spanish 5-digit numbers in AM at 0334. (Dean Burgess-MA)
6871.0	HEP 7-Kantonspolizei Zuerich, Switzerland, with VVV marker in CW, at 1505. (Boender-Netherlands)
6945.0	Unid-5-figure CW "numbers" at 1500. (Boender-Netherlands)
6959.0	Unid-Lincolnshire Poacher with 5-figure "numbers," simulcasting 11545, at 2000. (Boender-Netherlands) Long 5-figure broadcast, at 2040. (Burgess-MA) Unid, might be the Poacher, 5-figure, at 2217. (Bunyan-MO)
6984.0	SNN 299-MFA, Warsaw, with messages in RTTY (Pol-ARQ, 100), at 1440. (Boender-Netherlands)
6993.0	Air Force two, patch to Crown via Andy, at 0151. (Bunyan-MO) <i>Crown is the White House Communication Office. -Hugh</i>
7325.0	SAM 60201 and 27000-USAFAF VIP aircraft, working Andy on F-268. (Bunyan-MO)
7337.0	Unid-Lincolnshire Poacher numbers, late tune in at 2245. (Boender-Netherlands)
7600.0	Unid-Counter type 5-figure numbers, also 10597, at 1500. (Boender-Netherlands)
7831.0	Alligator-USAFAF working Nightwatch 01 (Airborne CP) in net with New Guard, Yuleman, Rebellion, Genetic, Textbook, and Ski Boot. Clear and ANDVT were used, beginning at 2010. (Haverlah-Texas)
8032.0	SAM 60206-USAFAF VIP, patching Robert Gray Base Ops, via Andrews AFB on F-498, at 0137. (Bunyan-MO)
8375.0	New Star Broadcasting, Taiwan, with Chinese female 4-figure numbers in AM at 1300. Similar transmissions heard on 8300, 9725, 11430, 13750, and 15338. (Yamaguchi-Japan)
8496.0	CLA-Havana, Cuba, with CW traffic list at 0628. (Dick Dillman-CA)
8636.0	HLW-Seoul, Korea, working CW ship traffic at 0612. (Dillman-CA)
8688.5	ZSC-Cape Town, RSA, with CW traffic list at 0635. (Dillman-CA)
9016.0	Chalice Alpha-signal check with Nightwatch at 1544. WAR 46, working Nightwatch, went to Z190 at 0123. Nightwatch with 26 character EAM, masked by own 400-Hz tone at 1517 and 1523. Magnavox-USAFAF, repeating 26 character EAM from Offut, then working Projector,

Nightwatch 01, and Double Up, advised that working freqs are Z175 and Z130, at 0135. (Haverlah-Texas)

9094.0 Unid-Spanish 5-figure numbers in AM, at 1113. (Bunyan-MO)

9132.0 King One working DoD Cape, told, "T minus 53," at 0148. (Bunyan-MO)
Atlantic Missile Range op.-Hugh

9219.0 Unid-English female numbers, 3/2 figure code groups in AM, at 2024. (Dix-NY)

9220.0 Unid-Spanish 5-figure numbers in AM, at 1106. (Bunyan-MO)

10204.0 Nightwatch 01-airborne CP, working Valorous, clear and ANDVT, at 1502. (Haverlah-Texas)

10600.0 XVN37-VNA, Hanoi, with news in English, RTTY (50/495), at 1518. (Hall-RSA)

10917.9 RFFIC-Marine Sirpa Paris, with news in French, mode ARQ-E3 (48/436), at 0725. (Bob Hall-RSA)

11043.7 RFTJ-French embassy, Dakar, in RTTY (ARQ-E3, 192/400), at 0631. (Hall-RSA)

11175.0 Hickam-USAF GHFS, Hawaii, with patch from U.S. Navy XD 03 to DSN number for "Naval Air Labs" in HI. Told aircraft, "Your party is on the line, requesting the shade." Reply was, "Exo has landed and been taken home." (Allan Stern) Unid-USAF C-141 with patch through Ascension GHFS to Newark, for landing arrangements and meteorological report, then pirep (44N by 54W), at 0050. (Ed Muro-NY) Teal 28-USAF weather recon, patch to Miami Monitor (National Hurricane Center) through MacDill Global, with coded data, saying satcom was down, at 1828. (Bunyan-MO) Unid-German Air Force Calling Andrews [AFB], can you hear me?" answered by Offutt GHFS, patch to German officer in Washington, DC, inbound for Dulles, heard at 2000. (Alden Wires-GA)

11181.0 King 33-USAF Rescue 33, ARRS, with patch to Rescue Ops via Offutt. (Bunyan-MO)

11244.0 Reputable-USAF, with test count, at common time for these, 0123. Offutt-USAF GHFS, with 6 character EAM "for Hailstorm" at 2340. Offutt with EAM "for Bell Pepper" at 2245. (Haverlah-Texas)

11270.0 Unid-Russian man, numbers in AM at 0820, and again at 1600. (Boender-Netherlands)

11470.0 Unid-English female "counter" numbers in 3/2 groups, AM at 1600. Also 12168. (Yamaguchi-Japan)

11494.0 Nightwatch 01-Airborne CP, working Valorous at 1507. (Haverlah-Texas)

11545.0 Unid-Lincolnshire Poacher, 5-letter "numbers" at 1400. Same, simulcasting 13375, at 1500, simulcasting 14487, also at 1500, simulcasting 13375, at 1600, and 6900 at 2000. Also at 2100. (Boender-Netherlands)
Wonder if this traffic picked up in the Iraq crisis. The Poacher seems pretty busy. -Hugh

11570.0 Unid-Cherry Ripe, 5-figure numbers format like the Poacher, twice at 1300. (Boender-Netherlands)

12056.0 Unid-Cherry Ripe numbers at 1200. Also 8320 and 13866. (Yamaguchi-Japan)

12204.4 ZSO-Durban, South Africa, with Navarea VII warnings in RTTY (75/150) at 0950. (Hall-RSA)

12270.0 Shark 11-aircraft over Texas, in radio check with Lobo (Howard AB Ops). (Bunyan-MO)

12831.0 3BM-Port Louis Radio, Mauritius, with CQ and announcement, "500 kHz is off the air until further notice," CW at 1806. (Dix-NY)

13207.0 Dark Star Mike-USAF, working Dragnet Sierra, at 2141. (Bunyan-MO)

13242.0 KGD 34-SHARES master control station, working stations in voice and data (PACTOR), at 1950. (Bunyan-MO)

13375.0 Unid-Lincolnshire Poacher, numbers at 1700. (Boender-Netherlands)

13467.0 SNN 299-MFA, Warsaw, Poland, CW channel marker at 1442. (Dix-NY)

13650.0 Unid-Spanish female voice with 5-figure "numbers," at 0303. (Sue Wilden-IN)

13996.4 STK-Khartoum Air, test slip with RY and callsign in RTTY (50/400) at 0516. (Bob Hall-RSA)

14405.0 UNHCR-United Nations, Bujumbura, with French messages about staff movements, in RTTY (Pactor), at 1550. (Hall-RSA)
UN High Commission for Refugees aid ops. -Hugh

14406.0 Unid-Counter" 3/2 English numbers in AM at 1100. Also 13555. (Yamaguchi-Japan)

14487.0 Unid-Lincolnshire Poacher, jammed and unreadable, at 1100, 1200, and 1300. Again, clear, simulcasting 10426, at 1400. (Boender-Netherlands) Unid-Poacher at 1200, also 15682 and 16804. (Yamaguchi-Japan)

14890.0 Unid-Russian man AM numbers, two days at 0800. (Boender-Netherlands)

14996.0 RWM-Russian CW time signals at 1710. (Boender-Netherlands)

15016.0 Offutt-USAF GHFS, with 6 character EAM "for Postulate" at 1938, "for Curley Top," at 1939. (Haverlah-Texas)

15821.7 SAM-MFA, Stockholm, with embassy traffic for Tel Aviv, in RTTY (Swed-ARQ, 100/400) at 1729. (Bob Hall-RSA)

16335.0 FZS 63-St. Denis Meteorological, with tropical cyclone warning from Reunion Island, in RTTY (75/400), at 0940. (Hall-RSA)

16357.0 OLZ-MFA, Prague, with news in Czech, RTTY (100/400), at 0859. (Hall-RSA)

16661.7 EGY-possibly London embassy, with 5-letter code groups in Sitor-B at 1150. (Hall-RSA)

16668.0 SAM-MFA, Stockholm, with news in RTTY (Swed-ARQ, 100/400), at 0945. (Hall-RSA)

17050.0 4XZ-Israel Navy, Tel Aviv, with VVV marker in CW, at 1415. (Boender-Netherlands)

17105.0 IRM-Rome, Italy, with CW traffic list at 1704. (Dillman-CA)

17113.0 GKB-Portishead Radio, England, CW traffic list at 1700. (Dillman-CA)

17416.8 SAM-MFA, Stockholm, with 5-letter code groups to Lagos embassy, in RTTY (Swed-ARQ, 100/400), at 0915. (Hall-RSA)

17417.3 SAM-MFA, Stockholm, with 5-letter code groups to Nairobi embassy, in RTTY (Swed-ARQ, 100/400), at 1537. Changed frequency from 17417.1. (Hall-RSA)

17432.0 DFZG, MFA Belgrade, with encrypted messages to many embassies, in RTTY (Baudot, 75), at 1437. (Boender-Netherlands)

17441.5 5YE-Nairobi Meteorological, with coded weather in RTTY (100/825), at 1555. (Hall-RSA)

17521.0 HSW61-Bangkok Meteorological, with coded weather in RTTY (50/209), at 1534. (Hall-RSA)

18064.0 SNN299-MFA Warsaw, with administrative details, then long message about Luanda, in RTTY (Pol-ARQ, 100/240) at 0801. (Hall-RSA)

18183.5 Algiers MFA (tentative ID), with news in French, at 0943. (Hall-RSA)

18183.5 MFA, Algiers, with French to "AMBALG Lagos," then Conakry, Kampala, and Budapest, all RTTY (Coq-8, 26.67), at 0840. (Hall-RSA)

18258.5 HBD 32-Swiss Embassy, Brasilia, with 5-letter code groups signed BRAZILAMA, in RTTY (ARQ) at 1240, again at 1527. (Hall-RSA)

18276.7 HBD31-Swiss embassy, Buenos Aires, with 5-letter code groups in RTTY (ARQ), at 1547, again at 1726. (Hall-RSA)

18360.0 KHSA-French embassy, Kinshasa, with 35 minutes of 5-letter code groups for MFA Paris, in RTTY (ARQ, 200/400), at 0930. Same station with 40-minute message to Paris at 0940. (Hall-RSA)

18538.0 NDJA-French embassy, N'Djamena, with French language in RTTY (ARQ, 200/400), at 0940, code groups at 1545. (Hall-RSA)

18661.7 EGY-London embassy, (tentative ID), with 5-letter coded message in RTTY (ARQ) at 1148. Kinshasa, with similar, at 1200. (Hall-RSA)

18760.0 RFGW-MFA, Paris, with scheduled transmission in 5-letter code groups, RTTY (FEC-A, 192/400), at 1520. (Hall-RSA)

19721.0 RKLM-Archangelsk Fishery Radio, Russia, calling 4LY in CW, at 1400. (Boender-Netherlands)

19860.0 GYA-Royal Navy, London, with RTTY (Baudot, 75), at 1404. (Boender-Netherlands)

20518.2 KHSA-French Embassy, Kinshasa, with several messages headed "SVC DIPL de KHSA," in RTTY (ARQ, 200/400), at 1009. (Hall-RSA)

20699.7 SAM-MFA, Stockholm, with traffic to Pretoria, then 5-letter code groups, in RTTY (Swed-ARQ, 100/400), at 1514. (Hall-RSA)

22108.0 Unid-Cherry Ripe numbers format at 0000. Also 15616 and 19884. (Yamaguchi-Japan)

26150.0 Unid-Lowest of Dutch paging signals, every 100 kHz all the way to 26850, in data mode, at 1530. (Boender-Netherlands)
Oh good, sounds like yet another 10-meter band indicator. -Hugh

26810.0 Unid-Another Dutch paging system, different from 26150 and others, data mode, at 1533. (Boender-Netherlands)



The First Digital Mode — Radioteletype

One of the oldest codes still in use today is the Baudot or Murray 5 bit code. Baudot radioteletype (RTTY) transmissions are based on the original 60 milliamp on/off current concept of the telegraph. Since there is no way to utilize current during shortwave transmissions, a *mark* and *space* system was developed to simulate on/off bit states.

The frequency separation (measured in Hz) between the mark and space is referred to as *shift*. Standard shifts used today for SW RTTY include 60, 85, 170, 425, 850 and 1200.

RTTY may be sent at different speeds, referred to as the *baud rate*. Typical baud rates and their equivalent words per minute are shown below. Speeds above 200 WPM are very unreliable for shortwave transmission purposes.

Baud Rate	WPM
45	60
50	66/67
57	76
75	100
100	132

The *polarity* or *sense* of the mark and space bits may be either normal or reverse and must be set accordingly.

RTTY also uses several different *alphabets*. These may include International (ITA2), Telex, Military, and several multi-shift variants for Cyrillic, Amharic, Greek, Korean, Thai, Japanese and Chinese. *Case* is a subset of the alphabet and can be either letters, figures or national.

All Baudot RTTY is transmitted in upper case (capital letters). Each character is made up of a combination of five zeros and ones (i.e., marks and spaces). With only five bits per character, transmission of more than 32 characters is impossible. Therefore, to accommodate letters, numbers and special characters, two shifts are used. A *letters* shift is utilized for the letters of the alphabet from A to Z. A *figures* shift accommodates both numerals and punctuation. The two-shift system permits the transmission of all the required "Latin" characters.

The Russian language, however, has many additional native characters. A special third shift for Cyrillic (the Russian character alphabet) was developed and is known as Third Shift Cyrillic. Even though most decoding equipment cannot represent Cyrillic characters, the Cyrillic characters do yield complete Latin transliterations. Some decoders, such as the Universal M-7000 and Universal M-8000, can actually display Cyrillic characters on the video monitor.

■ The Rise of RTTY

Most RTTY monitors in the hobby originally started out listening to the international shortwave broadcasters and gradually began to notice other AM transmissions in the shortwave bands. A limited number of aeronautical stations and numerous cable and wireless transmissions began to appear.

With the introduction of SSB modes, the true digital monitor was born. Increased use of Baudot RTTY on the airwaves saw the introduction of outboard decoders. However, only the strongest and cleanest signals could be decoded by the early AEA, HAL and Kantronics units — more sophisticated monitoring required more expensive equipment, often in the form of surplus commercial hardware.

In the 70's, Infotech introduced its high end/high priced line of decoders. The Wavecom unit was introduced in Europe, but was never promoted successfully in North America. RTTY monitoring continued to be a practice requiring additional peripheral equipment and much experimentation until the 80's.

Perhaps the most significant factor in the rise of popularity of digital communications for the hobbyist was the introduction of the personal computer. A relatively simple interface, coupled with intelligent software, now provides not only a means of decoding but also of analyzing digital transmissions. As new digital communication protocols are introduced, progressive software engineers can implement new code routines to process them.

With the advent of satellite technology, RTTY monitors lost the myriad of frequencies once used by the major press agencies such as the Voice of America, Associated Press and United Press International. With the demise of the Soviet Union, over 50 former TASS frequencies are now silent.

The largest single user of shortwave RTTY was the former Soviet maritime fleet. How has the Soviet break-up affected RTTY's share in digital communications? An analysis of digital HF signals from over 4,000 reported fixed station frequencies heard in North America during the past 12 months reveals the following mode usage:

RTTY	53.7%
SITOR	20.4%
ARQ-M	11.1%

ARQ-E3	9.4%
ARQ-E	4.5%
FEC-A	0.7%
All Others	0.2%

One can see that, despite the services that have now opted for newer communications modes and means of delivery, there is still plenty to monitor for today's digital utility enthusiast.

Although most stations use very low transmitting power in comparison to the international shortwave broadcasters, you will often be amazed at the strength of their signal. One prized North American catch for the broadcast listener is the Voice of Kenya: During the last 30 years, your editor has only heard them twice from his QTH. On the other hand, Nairobi Air and Nairobi Meteo deliver a 15 kW RTTY signal every night that will rival that of a local AM radio station! Digital transmissions, because of their signal nature, often have a way of "getting through," especially during poor propagation conditions when the broadcast bands seem dead.

Most of the 75 Baud RTTY transmissions you will encounter are military in nature and are indecipherable. Whenever you encounter an extremely strong 75 baud signal, you can generally assume it is one of Uncle Sam's facilities. Most diplomatic (embassy) communications using RTTY are also encrypted.

You can see that when first starting out in this phase of the hobby, it is just as important to know "what *not* to listen to." All too often new RTTY monitors are easily discouraged because they are trying to decode the wrong mode or encrypted signals.

With patience and experience you can develop an "ear" for the various modes, and in many cases be able to identify the mode by its sound. Many experienced monitors can even audibly determine the baud rate!

Virtually all decoders, from the most elementary to the most sophisticated, are capable of decoding RTTY transmissions. To get off to a good start with your hamfest hardware or your slick new software, try for these RTTY transmissions which should be easily logged:

CFH - Canadian Forces, Halifax	4271.0, 6496.4, 10546.0, 13510.0
SYD - Nairobi Air, Kenya	7423.0
5YE - Nairobi Meteo, Kenya	7461.0, 9041.0, 10384.6, 17441.5
HZN - Jeddah Meteo, Saudi Arabia	4570.0, 7510.0, 10215.0, 11125.0, 17592.1
USAF Offutt AWS AFB, Omaha, NE	3228.0, 5904.0

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BBC, Others Commit to Digital Shortwave

BBC World Service has joined an international consortium in signing an agreement in China to develop standards for digital radio technology, which promises interference-free SW listening, and automatic frequency changing as needed. Digital Radio Mondiale also brings together transmitter and receiver manufacturers, such as Sony, Sangean and Telefunken.

Standards could be ready for ratification by the ITU in two years. Sets would cost about \$30 more than conventional SW receivers, and could be in shops by 2003. World Service SW transmitters could be upgraded for less than a quarter kilopound per site, says a BBC press release. The other stations involved are DW, RFI, VOA and RN, says *Radio-Enlace*.

■ Caribbean May Return on Shortwave

Aside from Cuban and Dominican Republic relay sites, there has been no SW broadcasting from the Caribbean since the demise

of R. Free Grenada. Now Carl Moore, chairman of the Barbados Broadcasting Authority, is calling for a SW service to be established in order to promote the island's development and for the Bajan diaspora.

Two four-hour services in the European and North American evenings would suffice; might cost \$1 million to set up but would be well worth it. The Government Information Service should run it; in the last four years there was one application for a SW service, but it was withdrawn, says a story by Barry Alleyne in the *Daily Nation* via John Ebeling, *World of Radio*.

Meanwhile, we wouldn't be surprised if there is a radio angle to **New Utopia**, a new country supposedly under construction beginning in April upon Rosario and/or Misteriosa Banks (submerged islands) between Cayman and Belize. It's designed as a tax haven, and offers citizenship if not residency for a price paid to Prince Lazarus with an Oklahoma phone number; as interviewed on *Talk USA* via WHRI, heard by Ernie Behr.

grading the studios in Montreal (Bill Westenhaver, RCI, *World of Radio*) This means RCI will be switching over in the next three years to brand new digital transmitters; two more recently bought can be converted to digital, with the equivalent of a computer card (Bob O'Reilly, RCI director, on RCI via BBCM)

CHILE Thanks to a tip from Ron Trotto, I heard Voz Cristiana testing on 21551 for three days only in early March, from as early as 1335 to as late as 1957* with soft gospel-rock music, IDs in English and Spanish claiming 21550. This is the former Voz de Chile facility, sold and reactivated at last (gh, OK) Preliminary tests toward Mexico; plans to program from Miami via satellite, powered down to 70 kW (Voz Cristiana via Tom Sundstrom)

CHINA Yunnan PBS General Service on SW now seems off the air; had been on 7210, 4760, 2460; but the minority language service from Kunming is on 6937v at 0355-0545, 1100-1500, 2200-2445 (BBCM)

Guangxi PBS, Nanning, 2200-1600 on 4915. Guangxi Economic Broadcasting Station, 2200-1600 on 5010 (BBCM)

Ten new transmitters with 500 kW each, and four MW of 600 kW each were installed in Xinjiang and Yunnan. A challenge in 1998 is adjusting the broadcast times of 38 foreign language services, some of which were set 40 years ago (CRI *Messenger* via Wolfgang Buschel, BC-DX)

CRI on 9900, probably via Urumchi, 1800-2227* in various Euro languages, huge signal since Jan 1, probably 500 kW. NASWA should count Xinjiang as a separate radio country, just like Tibet and Manchuria. Under Soviet control from 1944 to 49, Xinjiang was known as the Republic of East Turkestan (Ernie Behr, Ont.)

COSTA RICA RFPI expected more changes than usual for its 2nd-quarter programming, perhaps 15% retimed, and some new shows. *Feminist International Radio Endeavour* already in March reduced from daily to three days a week, opening many hours for repeats of other programs. The 30 kW AM on 7385 took a break at 0800-1400, but 6980-USB remained until 1200, then 15050-USB. There were also plans to exchange AM and USB on 6980 and 7385 (gh)

CUBA From February until mid-March, more than 200 kHz of the 31 meter band was blasted with noise bursts every few seconds, centered on 9550. We suspected it was Radio Havana Cuba's transmitter between 1100 and 1300, and reported this to the DX world. When RHC's Arnie Coro heard about it, he broadcast a vicious personal attack on yours truly, while admitting RHC in fact was the source and the problem had finally been fixed. No thanks for the information nor apology for weeks of interference (gh)

CYPRUS TURKISH CCA factory in Georgia finished testing new transmitter for R. Bayrak, 6150, March 10, shipped it, should be on air in 30 days (Hans Johnson, *Cumbre DX*)

ECUADOR HCJB abruptly dropped 9365 for English to Europe at 0700-0900, following a



All times UTC; All frequencies kHz; * before hr = sign on, * after hr = sign off; // = parallel programming; + = continuing but not monitored; 2 x freq = 2nd harmonic; J-98=May-Sept; Z-98=Summer season; W-98=Winter season; [non] = Broadcast to or for the listed country, but not necessarily originating there.

AFGHANISTAN R. Afghanistan, the anti-Taliban, pro-Rabbani station, appears to operate from Taloqan, in the centre of Takhar Province in northern Afghanistan; on the same frequency as the Tajik opposition's V. of Free Tajikistan, and may well be sharing facilities; erratic and times vary up to 10 minutes: 0230-0330, 1430-1530 on 7084v (BBC Monitoring)

ALASKA KNLS Z-98 English: 0800 9615, 1300 7365 (BC-DX)

ANGOLA Emissor Provincial da Huila, 4820, at 0407 with Elvis music, 0433 ID (Jon Oldenburg, *Cumbre DX*)

VORGAN might not close Feb 28 as planned due to renewed hostilities (Nick Grace, *Cumbre DX*) Remained on the air into early March, 6225 and 9770 (Mahendra Vaghjee, Mauritius; Godfrey Clemiston, RSA, DSWCI DX Window) UNITA was to shut down VORGAN by March 31 (HCJB DX Partyline) **AUSTRALIA** An ABC advisory board has called for the reactivation of RA's transmitters in Darwin. Cost of recommissioning them would be more than compensated by the foreign affairs benefits to Australia. The Australian Democrats have urged the same, to get reliable news into Indonesia (R. Australia via BBCM) Another report says they were likely to be sold off (Mike Bird via Joe Hanlon)

Australian Defence Forces Radio says now on 15635 at 0300-0600 (Hans Johnson, *Cumbre DX*) 15635-USB, +0300-0332+ in English with a live variety show to *HMAS Tobruk*, RTTY QRM (John Kecskes, Australia, DSWCI DX Window)

BELARUS R. Belarus plans to increase transmissions with beams to NAm, Au (webpage via BC-DX) Home service heard 1600-2300 on 5 kW non-directional 11670, //6115, 7145 (DX Mix, Bulgaria, via DSWCI DX Window)

BELGIUM RVI Z-98 English: 0730 on 7290, 9940; 1030

on 9925, 15595; 1230 NAm 15545; 1630 on 5910, 7290; 1730 on 11810-Germany relay, 17655; these and 2000 also on 1512 MW, but at low power except for 2000 (RVI Radio World) The German relay at 1730 on 11680 to ME during W-97 always had good signals here (Brian Alexander, PA) RVI does not limit QSLs to one per semester; I get lots of them, and now everyone can with the demise of their listeners' club (David Crystal, Israel, CIDX Messenger)

BRAZIL R. Clube de Ribeirão Preto, 15414.8v, 2300-0500+ with Braz pop music, fair (Ernie Behr, Ont.)

R. Globo, weak but clear with echo ID at 2030 on exactly 11804.0 (Jay Novello, NC)

RNB's English at 1200 and Spanish at 1330 on 15445 suffer not only from worn-out tapes but a worn-out transmitter, putting spurs on 15500 and 15390 (gh, OK)

CANADA RCI has gotten a one-time grant of \$15 million from the government, spread over three years, for improvements at Sackville and up-

complaint from Colombia that it interfered with PTP communications; still on 5865 (Allen Graham, HCJB via BDXC-UK) It may take HCJB 3-4 years to relocate 11 SW transmitters, 32 antennas and 48 towers at Pifo, which is in direct line with a new international airport, at a cost of \$5 million. Some broadcasts may go on relays in other countries, some targets may be dropped, and HCJB may eventually drop SW to all areas outside Latin America. HCJB will not rebuild the European antennas. Emphasis will be to move as little as possible and rent and relay as much as possible (*WDXC Contact* via BC-DX)

EGYPT R. Cairo, English to NAm at 2300 on 9900 continues to disappoint with its audio quality. Poor modulation continues at 0200 on 9475. Voice is distorted and weak. Only music breaks through. This is on-going 6-7 years! Sigh! (Bob Thomas, CT)

ESTONIA Estonian Radio reported that its [only] SW transmitter on 5925 would be disconnected from March 1. External services would continue on FM, internet (BBCM)

ETHIOPIA R. Fana, 6210 at 0400-0435, but covered by Iran on same until 0426 (Bill Harms, MD, *hard-core-dx*)

[non] R. V. of United and Free Ethiopia, seemingly from Central Asia, 1615-1715 Sun and Wed in Amharic on 7570; RealAudio available at <http://ethiopia.org> (BBCM)

[non] Rainbow Radio, 5910, Sun 1000-1100 via Germany in Amharic gave address: P. O. Box 140104, 53056 Bonn, Germany (Martin Schoech, Germany)

FINLAND For Z-98, YLE R. Finland, English to NAm moves to evening, 0200-0230 on 9780, 11900; still in morning at 1230 on 15400 and 11900, but Sundays only (Raimo Makela, YLE Poro, *rec.radio.shortwave* via *radio-escutas*)

GEORGIA Abkhaz Radio, Sukhumi, 9494.74V puts a fine signal into Europe, Abkhazian at 0445 (Wolfgang Büschel, Germany, *BC-DX*)

GHANA GBC Radio 1, 4915, was putting spur on 4793V until 2400*. The spur drifted but not the fundamental (Bob Hill, MA, *NASWA Journal*)

GREECE [non] VOG planned many more relays via VOA Greenville and Delano USA sites for Z-98, including prime-time at last: 0000-0400 11605-G, 0200-0400 6125-D. At 1200-1400 on 9595-D, 9730-D, 9775-D; 1800-2200 on 11730-D; and many more in the 0600-1200 period (HFCC via Bob Padula and Matt Francis, *Electronic DX Press*)

GUINEA Rdif. Nationale, Conakry, reactivated in mid-March on 9650 //7125, 2330-2430+, also announcing 6155, 15310 (Jay Novello, NC)

INDIA Newest AIR transmitter is 50 kW on 6040 testing from Jeypore, the first in Orissa state, 0700-1000, 1600-1700. May have been the one on 5040 by mistake heard by Vaghjee (Manosij Guha, DSWCI DX Window and *Cumbre DX*) Later heard using both (Guha, *Cumbre DX*) The SW antenna switching hall in the Kingsway camp transmitter site in Delhi is in a state of disrepair (Guha, *DX Grapevine* via *Cumbre DX*)

INDONESIA VOI in English at 0100 on 11785 vs Brazil on 11785.14, even better on //9525 and in the clear on USB (Al Quagliari, NY)

IRAN IRIB finally has official homepage online, <http://www.irib.com> (Thorsten Koch, DSWCI DX Window)

[non] V. of Southern Azerbaijan (Azeri: *Bura Janubi Azerbaijan Sasi*) is operated by the National and Independent Front of Southern Azerbaijan. This Iranian province borders the Republic of Azerbaijan and is hostile to the Iranian government. The radio is believed to transmit from Israel. Says it broadcasts programs about the "daily life of the people of Southern Azerbaijan under Iranian oppression, the struggles of our brothers who live in Northern Azerbaijan (Republic of Azerbaijan), their long standing war with the Armenian enemy who receives help from Iran, programs about our Azeri inheritance, our great history and civilization..." Address is Vosa Ltd., Postfach 108, A-1193 Vienna, Austria. Anticipated timeshift for summer: 0515-0615 on 11935, 1530-1630 on 7095 (BBC Monitoring)

DTK pinpointed this to the Israel/Jordan/Sa'udi Arabia area (DARC via *BC-DX*) One day on Israel's HS channel 12080 or 12075 I heard open carrier with Reshet Bet in background, then VOSA signing on. So Israel seems to be right location (Nikolay Pashkevich, Russia, *Cumbre DX*) An investigative report shows how this could be connected to the Mossad and the Iran-Contra scandal of the 1980s, on the Clandestine Radio Intel web, <http://www.qsl.net/yb0rmi/vosa.htm> VOSA advocates integration with Azerbaijan (Nick Grace C., *Cumbre DX*)

IRAQ Iraqi News Agency, INA, radioteleype service as monitored in March with timeshifts expected for summer: 0600-2000 exc Fri, Arabic on 10162.5; 0830-1500 daily English on 14699; both F1B 75 baud. During periods of crisis, Arabic may start as early as 0300; signals alternate between idling and traffic over the entire span. Addr.: INA, P. O. Box 3084, Salihiyah, Baghdad (BBCM)

R. Iraq Int'l resumed attempts at external service in late Feb (gh) Baghdad, 11785, varies day to day; one day German was at 2110-2130, the next +2100-2130+. They have managed to put the worst modulation into the air of all stations from the region. Even R. Cairo is better (Harald Kuhl, Germany, *Cumbre DX*) Strong carrier but poor, distorted audio with English at 0410-0430 on 11785, couldn't tell whether still English afterwards (Brian Alexander, PA)

Republic of Iraq R. the main domestic service at 0255-2415 was heard intermittently on 9715 around 0615-1000, 11785 at 1000-1400 in late Feb (BBCM)

[non] Among those supporting a R. Free Iraq proposal testifying at a congressional hearing were former CIA director James Woolsey, Republican

presidential candidate Steve Forbes, and Secretary of State Madelaine Albright (Nick Grace, *Cumbre DX*) Republican senators have added \$5 million to the DOS authorization bill to be used to establish a R. Free Iraq via Kuwait (*Washington Post* via Hans Johnson, *Cumbre DX*)

IRELAND [non] RTÉ is relaying on SW the weekly program *Worlds Apart* on problems in developing countries, to reach thousands of Irish aid workers and missionaries, 13 weeks starting March 10 (Wesley Boyd, RTÉ) Tue 2305 on 9925 to SAM via Germany, repeated Wed: 1330 12015 Irkutsk, 1500 15120 South Africa, 1600 & 1700 11605 via Germany (via Finbarr O'Driscoll, *Review of International Broadcasting*) Times and frequencies may have shifted from April, especially the original 2300 broadcast, now 2200? (gh)

ISRAËL Israel Radio Z-98 in English: 0400-0415 on 17535, 11605, 9435; 1030-1035 on 15650, 15640; 1400-1430 on 17535, 15650; 1545-1557 on 17535, 15650 and 1545-1600 on 11605; 1900-1925 on 15650, 15640, 11605, 9435. Reshet Bet in Hebrew adds two much more powerful transmitters to us at 0100-0300 than we have had for several years, 9390 and 15615 (Doni Rosenzweig) Could that open the door for resuming prime-time English? (gh) Reshet Bet is 24h on Internet at <http://bet.netvision.net.il> (via Alexandre Doria, *radioescutas*) See also IRAN

JORDAN R. Jordan inaugurated a new 8 megadinar building in Amman with modern studios; and started a new service on MW, The Voice of Awakening, Jordanian Armed Forces Radio (BBCM)

KOREA NORTH KCBS provincial stations relay Pyongyang except for local programs weekdays around 0500-0600: Chongjin 3980, Hamhung 3220, Pyongyang 3350, Sariwon 2350, Wonsan 3970v, Hyesan 3920, Kanggye 3960. All SW use is sporadic. KCBS, Pyongyang: 2100-1800 on 11680, 11400, 9665, 6100, 3960, 3350, 3220, 2850, 2350 (BBCM)

LIBERIA R. Veritas, 0514-0613 on new 5470, tribal African chants, 0558 English ID with frequency (Giovanni Serra, Italy, *The Four Winds*) Until 2204* in mid-song was still on 3450 (Jay Novello, NC)

MALAYSIA V. of Malaysia has Real Audio available at <http://asiaconnect.com.my/rtnet> English is at 0700-0825 on 15295, 9750, 6175, preceded by V. of Islam at 0455-0700 (BBCM)

MALI March-April issue of *CRI Messengers* shows Mali relay again in use, but in English only on 7170, 2000-2130 Af, 2200-2300 Eu (Randy Stewart, MO)

MALTA [non] V. of Mediterranean relay via Italy for Z-98 expected to be retired to 0630-0730 Mon-Sat, 0700-1200 Sun. The W-97 frequency was 9660 (Francesco Clemente, BDXC-UK) And 2030 via Russia for Z-98 on 12060 Serpukhov (Josef Zimmerman, Germany, *Weltweit Hören* via *BC-DX*)

MEXICO XERTA resumed testing 4800.7 in mid-March, with same IDs, same heterodyne with Guatemala, heard at 1230 (gh)

MONGOLIA The new station on 4790 was expected to start broadcasting this spring; installation was not completed before winter started (Ludo Maes, *Cumbre DX*) unID Mongolian on 4785 *2150, 2230 English lesson (Vladimir Titarev, Ukraine, NU via *BC-DX*) Maybe Hohhot, China, since it relays Beijing minority Mongolian service (Dave Kenny, England, *ibid*)

MOROCCO RTM seems to have resumed using Tangier transmitters, which had been off for at least a year, such as 1010 in Arabic on 15345 //VOA Briech relay on 15335, still at 1900 mixing with Argentina. And on 17814.8v strong at 1804 with English ID as "International Service of R. Morocco" (Noël Green, UKoGBaNI, *BC-DX*)

NEW ZEALAND For April, RNZI abandoned 15115 completely, switching from 11735 to 17675 around 2100, then 11905 from 0459, and replacing 9700 after 0717 (Sat and Sun 0759) is 9795, but another schedule takes effect May 4 (RNZI)

NIGER After many months off the air, La Voix du Sahel was back on 5020 in early March, 1700-1859+ (Mahendra Vaghjee, Mauritius, DSWCI DX Window) 5020.0 until 2301* on a Sat (Mark Fine, VA, *swltalk*) -2200* on weekday; while off we could hear Solomon Islands from *1900 (Harald Kuhl, Germany, DSWCI DX Window) via WWCR? (gh)



DX Listening Digest

More broadcasting information by country compiled
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NIGERIA V. of Nigeria resumed 15120 in early March around 1900 (Ron Trotto, IL, *World of Radio*) External service is on 7255 and 15120 daily continuously from 0500 to 2300, with English at 0500-0700, 1000-1100, 1500-1700, 1900-2100; also French, Hausa, Swahili, Arabic; and a language you might not recognize, Fulfulde, at 0900-1000, 1300-1400, 2100-2200 (BBCM)

[non] With the help of bearings from several other European monitoring stations, we are now able to confirm that V. of Free Nigeria is coming from Jülich, Germany, rather than Africa. Signals from Germany hit the ionosphere over Africa, then bounce back towards Europe from a southerly direction, hence the false southerly bearings in the UK (Dave Kenny, BBCM, *World of Radio*) So, watch out for backscatter! (gh) VOFN is Sat 1900-2000 on 11645 in English and others, alternate 12015 (BBCM) Z98 registration is 12015, 170°, 100 kW Jülich (Wolfgang Büschel, *BC-DX*) But on 11645 mentioned new fq of 11985 (Nikolay Pashkevich, Russia, *Cumbre DX*)

R. Kudirat on new 11540 at 1913-2001*, lengthy anti-Abacha commentary, soliciting demographic info (Jay Novello, NC, *NASWA Journal*) New 11540 is synchronized with old 6205 at 1900-2000, definitely also via South Africa (Wolfgang Büschel, Germany, *BC-DX*)

R. NADECO plans to expand to two hours a day when funds become available (Hans Johnson, *Cumbre DX*)

NORWAY RNI Z-98 shows lots of out-of-band frequencies on 15 MHz: 15625, 15640, 15650, 15675, 15695, 15705, 15735. And 18950 at 1000, 1600 and 1800. Times for English on Sundays had not been decided in early versions (via Joe Hanlon, Richard Lemke)

PAPUA NEW GUINEA Drought and hydroelectric power shortage may account for absence of these stations: 3205, 3235, 3290, 3335, 3355, 3375 (Anker Peterson, Fiji and New Zealand, *DSWCI DX Window*)

PERÚ R. Origen, Huancavelica, 1140-1215 huaynos, ID on 4700.6 (Pedro F. Arrunátegui, Lima) R. Origen used to be on 5323.6, celebrated 7th anniversary in Feb (Takayuki Inoue N., *Relámpago DX*) Then heard on 5323.7 was La Voz de Anta, in Anta, Acobamba, Huancavelica, at 0055-0140 and 1105-1150 with ID, folk music (Arrunátegui) Probably bought the transmitter from Origen (gh)

R. JSV, Huánuco on 6060 at 1028 with pentacostal service; had to use USB to avoid Argentina on same frequency (Fernando Viloria, Venezuela)

PORTUGAL R. Portugal announced in mid-March that its foreign-language broadcasts, English, French and Tetum, would be terminated at the end of March; the existing Portuguese services would continue on SW on a restructured schedule. English had been on the air since 1954, and was known as Voice of the West in the 60s and early 70s (Roy Baker, via Mike Barracough, *World DX Club*) What a shame (gh)



RDP Lisbon put distorted signal in ham band on 21351.85, peaking weekends at 1650 on fundamental 21515, matched by 21678.15. German Amateur Radio Club bandwatch department found the spur (Wolfgang Büschel, *BC-DX*)

QATAR QBS Doha on new 9520 ex-7210 at *0245-0705* //9570, a bad choice with R. Liberty, Iran and V. of Sudan nearby (Mikhail Timofeyev, Russia)

ROMANIA RRI has 36 different QSLs (Frederica, RRI via Gigi Lytle) Loud roar, hardly any modulation audible on 17850 around 1330 (gh) It's Romania's home service (Kai Ludwig, *BC-DX*)

RUSSIA R. Bashkortostan, Ufa, 4485 at 2300-2100 for summer timing, carries music channel of Russia's Radio when not carrying its own local programs; in Russian, Bashkir, Tatar (BBCM)

R. Region Tyumen, 2300-2100 on 4895, 4820 (BBCM)

VOR's new 7100 with a megawatt at 0000-0600 replacing 7105, was pressured by German and IARU ham bandwatch organizations to quit intruding on the hamband (*BC-DX*)

SAUDI ARABIA BSKSA variant frequencies noted at 0300-0600: 9553.56, 9578.70, 9619.42, 9718.36; at 1600 on 11708.23, 11833.51, 12038.48 = 2 x 6019.24 (Wolfgang Büschel, Germany, *BC-DX*)

SIERRA LEONE SLBS, 3316, back on SW, now reflecting views of the civilian government instead of the Revolutionary Council (SL website via Hans Johnson, *Cumbre DX*)

SINGAPORE The Merlin SW relay here, once all for BBC, in M-98 added DW at 2200 Indonesian, 2300 English on 5975. Z-98 adds Switzerland, 1100-1330 on 9810, 1400-1615 on 9575; and Netherlands 2230 Indonesian 6120, 2330 Dutch 9590, 1130-1330 Indo 11690 (HFCC via Bob Padula, *Electronic DX Press*)

SOMALIA V. of the People on 7035 ex-6870 at 1610 in Arabic, 1700 ID in English (Mahendra Vaghjee, Mauritius, *DSWCI DX Window*)

SYRIA Syrian Arab News Agency, RTTY service F1B 50 baud all on 11080, 3560 daily: Arabic to ME/AF 0800-1000, 1100-1400 on special occasions only, 1500-1800; French/English to Eu 1000-1100, 1400-1500, 1800-1900 (BBCM)

TAHITI RFO noted with greatly improved signals on 15170.0, not drifting, excellent during daytime, maybe on 24h; in Tahitian and French until 0600, then France-Inter relay from Paris, not the same program as on RFI which is Radio-Monde-1. Suspect new transmitter, unlike previous erratic, weak and drifting signal around

15167v; first discovered by Chris Hamblly (Bob Padula, Australia) Sometimes audible here, but rarely in evening. No powerhouse, but better than nothing which was expected (gh)

UK o G B a N I BBC WS launched a breakfast news program for Europe March 30, 0330-0600 on MW, and SW 6195, 9410, *The World Today for Europe* (BBC Press Office)

[non?] **Media Zoo**, a media program on CMR via Astra satellite, planned to launch a new weekly show in addition, via Sirius 2 and on SW via the Merlin network (UK Gold teletext *In Orbit* via Ray Woodward, BDXC-UK)

USA FCC has issued WBCQ calls for Allan Weiner's new SW station in Maine. When it goes on air in late summer, will offer discount rates for free radio broadcasters (Anita McCormick, *DXing.com*)

WHRA added *DXing with Cumbre* to its schedule, but it failed to appear Sun 0500 on 9400; did appear Sun 2130 on 15460, the final airing when also on KWHR 17555 (gh) FINOVA officially sold the station to WHRA owner LeSEA on March 3 for \$1.5 million, lower than the \$5 million paid by the previous owner in 1994. FINOVA, a New Jersey-based lender, was forced to foreclose on WVHA last August. WVHA also did not pay property taxes. Tax bills were paid by FINOVA and are now current. The Christian Science Monitor Network contributed between \$115K and \$120K a year to the town coffers of Greenbush. The station would still be the town's biggest taxpayer, now an estimated 13% at its \$6 million tax assessment. It was unclear if LeSEA would seek property tax exemption as well (*Bangor Daily News* via Owen Williamson)

The expected UT Mon 0400 broadcast of *World of Radio* on WWCR would be on 5070, not 3210. Check our website for latest info (gh)

It may be July before WGTG's second transmitter is in use (Dave Frantz, WGTG via Hans Johnson, *Cumbre DX*)

More on Mother Angelica's conflict with the Vatican: she subsequently claimed to have heard directly from Jesus and Mary endorsing her broadcasting and healing an infirmity. Los Angeles Cardinal Mahony isn't buying it (*National Catholic Reporter* via Owen Williamson, *Review of International Broadcasting*)

With MUF rising, I'm hearing these remote-pickup links almost daily, both NBF, full-quieting with little fading: 25870, WFLA Tampa around 1600; 26470, "Mix 107.1" with Motown, rap, reggae, hip-hop, Florida ads around 1600, 2-3 S-units stronger than WFLA (Robert Hornuth, AZ)

USIA's expansion plans for 1998-99 include: shipping transmitters and other equipment from downsized or closed stations to those closer to priority audiences in Africa and Asia; constructing new antennas; adding satellite ground stations; installing energy-saving solid-state modulators at various sites; converting satellite transmission network to digital; expanding combined VOA/RFA service to China to 24 hours; augmenting the previously planned Tinian relay; purchasing and modifying a privately-owned facility on Saipan [KHBI]; expanding audience research. \$4M have been earmarked for developing a Farsi-language surrogate broadcasting service to Iran. However, the FY 1999 budget request calls for a reduction in positions, including eliminating the SW site in Rhodes, Greece, 27 positions; Office of Engineering headquarters staff reduced by 20 positions; Office of Cuba Broadcasting staff by 30 positions (from a much lengthier USIA press release via BBCM)

Donald Flamm, 98, died in February in West Palm Beach. During WW II, he devised the network of stations that broadcast American propaganda in Europe. That later became known as the VOA. He also produced plays and owned radio stations (Tim O'Melia, *Palm Beach Post*, via Mike Cooper)

R. Free Asia added more Mandarin March 1 at 1800-2000 on 7530, 9355, 9650, 9885, and from 1900 on 9905 (Dan Ferguson, IBB, *Cumbre DX*) That's 2-4 a.m. in China: imagine traitorous citizens tuning in the barbarians' nasty truth with earphones under the covers in the middle of the night (gh)

UZBEKISTAN R. Tashkent, English at 0100 added another frequency for a total of six: 7105 //5040, 5955, 5975, 7205, 9540 (Wolfgang Büschel, Germany, *BC-DX*)

VIETNAM Yen Bai regional on new 6630.4 0950-1230* but not daily, with Hanoi relays except for local program 1130-1230* (Roland Schulze, Philippines, *BC-DX*)

V. of Vietnam Network 1: 2200-2400 10060v, 5925v; 0000-1600 11540v, 10060v, 5925v; Friday only to 1700* on 10060v, 5925v with *People's Army* program at dictation speed.

VOV Network 2: 2200-1600 on 12035, 4960.

VOV Minority Language Service, mostly on MW, has this on SW: Hmong 0500-0530 and 1300-1345 on 6165; 2200-2230 on 5035 (BBCM)

[non] VOV is relayed via Russia 7440 at 1800 English, 1830 Vietnamese, 1930 French, followed on same transmitter at 2000 by VOM Malta relay in English (Noël Green, UKOGBANI, *BC-DX*) When the VOV relay switches to 7390 in Russian, 2030 Vietnamese (Klaus Lieberwirth, Germany, *ibid.*) Feed isn't perfect, but modulation much better on the relays than direct from Vietnam (Kai Ludwig, Germany, *Cumbre DX*)

Until the Next, Best of DX and 73 de Glenn!

New website: <http://www.angelfire.com/ok/worldofradio>



Tahiti
RFO
RADIO FRANCAISE DE TAHITI

Broadcast Loggings

Gayle Van Horn



GLOBAL FORUM

0000 UTC on 9680

THAILAND: Radio Thailand. National news on Bangkok's future as an international aviation hub for business. Good clear signal throughout the 30 minute broadcast. (Dale Fisher, Cleveland, OH) 4830 at 1503. (Francesco Clemente, Udine, Italy/Radio DX Net)

0101 UTC on 3270.05

NAMIBIA: NBC. Instrumental ballads to announcers chat, SINPO= 24343. (Mark Veldhuis, Borne, Netherlands, Hard Core-DX)

0102 UTC on 11785

INDONESIA: (Java) Voice of. Woman announcer with English news items on the national economic crisis. Fair signal and gaining strength, battling with Brazil's **Radio Guaiba** on 11785.14. (Al Quagliari, Albany, NY) **RRI-Jakarta** (Java) noted at 1500 and 2330 on 11760 kHz. (Zacharias Liangas, Thessaloniki, Greece/Hard Core-DX)

0105 UTC on 5005

NEPAL: Radio Nepal. Talk and commercials with fair signal quality. (Liangas, GRC) Station noted in Nepalese at 1558 with regional music at ID at 1603. (Klaus Elsbusch, Marienthal, Germany; Pierluigi Calligaro, Udine, Italy)

0130 UTC on 4800

GUATEMALA: Radio Buenas Nuevas. Spanish. Religious text and music to 0330*. (Lee Silvi, Mentor, OH)

0130 UTC on 9905

SWITZERLAND: Swiss Radio Int'l. Mellow music program to announcements. (Sue Wilden, Columbus, IN) Audible 1405 on 13635. (Moser, IL; Woody Pope, Garland, TX) 9885, 0100-0130; 6135, 0025-0130. (Albert Arnold, Chesterfield, VA)

0130 UTC on 9730

SRI LANKA: SLBC. English programming with a good variety of music until wiped out by China Radio at 0255 nightly. (Silvi, OH)

0132 UTC on 9820

CUBA: Radio Havana. Programming preview to newscast including item on the Helms-Burton Law, to *Time Out* program. (Wilden, IN) Heard 0320 on 9820. (Pope, TX; Arnold, VA)

0155 UTC on 4995

PERU: Radio Andina. Spanish comments to ID and religious programming. Other Peruvians noted: **Radio Satelite** 6725 at 0155; **Nacional del Peru** 6095 at 0230; **Radio Cuzco** 6203 at 0230; **Radio Los Andes** 6480 at 0346; **Radio Ancash** 4991 at 0400. (Enrique Alejandro Wembagher, Buenos Aires, Argentina) **Radio Huanta** 4747.47 at 2000. (Yoder, PA)

0230 UTC on 7280

SWEDEN: Radio Sweden. National news on Asia's financial woes affecting Sweden's economy. (Joe Wood, Augusta, SC) Station also noted at 1238 on 11650 (Wilden, IN) 1430 on 11650 (Moser, IL) Audible 11735//15400 at 1240. (Fraser, MA) Swedish satellite report on 7115 at 0344. (Pope, TX)

0237 UTC on 4800

LESOTHO: Radio Lesotho. Audible at station sign-on, with interference from Guatemala's Radio Buenas Nuevas. Lesotho fading out by 0505. (Silvi, OH)

0245 UTC on 7160

ALBANIA: Radio Tirana. General news featuring item about Italian immigration laws and cigarette smuggling into Albania. (Wood, SC) 2200-2228 on 6025. (Arnold, VA)

0300 UTC on 7100

RUSSIA: Voice of. Interval signal to sports report. (Sue Wilden, Columbus, IN) *Science & Engineering* on 5905 at 2115. (Bob Fraser, Cohasset, MA; Moser, IL; Paul Ormandy, NZ)

0422 UTC on 4930

HONDURAS: Radio Internacional. Spanish musical ballads to 0427 ID. Minimal QRM from Morse code adjacent to lower sideband, but otherwise nice signal. (Mark J. Fine, Remington, VA)

0441 UTC on 4770

NIGERIA: Radio Nigeria. English newscast *News in Brief* to national news items. UTC time check into pop music show. (Harold Fodge, Midland, MI) Station noted on 6090 at 2225 in Hausa service. (Liangas, Greece/Hard Core-DX) **Voice of Free Nigeria** heard on 11645, 1900-2000 in English. (Richard J. LaFountain, Paulding, OH; Howard J. Moser, Lincolnshire, IL)

0523 UTC on 6055

SPAIN: Radio Exterior Espana. News on Gallup Poles and Washington, DC, opera series. (Moser, IL; Pope, TX) Mailbag show, news and music 0003-0110 on 6055. (Arnold, VA)

0525 UTC on 7375

BULGARIA: Radio Bulgaria. Sports report with fair signal. (Moser, IL) Station noted on 7530, 2236-2300 with item about King Basil II. (Wood, SC; Arnold, VA)

0539 UTC on 6064.55

COLOMBIA: Colmundo Bogotá. Upbeat Latin popular music interspersed

with announcements by woman. "Canned" ID at 0551, noted frequency down from nominal 6065 kHz. (Fine, VA)

0601 UTC on 9780

YEMEN: Yemen Radio. English news to martial music and broadcast summary. Poor-fair quality. (Ormandy, NZ)

1016 UTC on 4682.25

BOLIVIA: Folk accordion music to male DJ's chat to instrumental organ music. (Andrew Yoder, Mont Alto, PA)

1230 UTC on 6120

CANADA: Radio Japan relay. *Music Journey Through Asia*, featuring music of the various Far East nations. (Bob Fraser, Cohasset, MA) RCI noted on 5975 at 2000-2025. (Arnold, VA)

1245 UTC on 17575

FRANCE: Radio France Int'l. *Arts in France* featuring an exhibition of the late U.S. photographer Dorothy Langhorne. (Fraser, MA)

1245 UTC on 13730

AUSTRIA: Radio Austria Int'l. Mailbag program with query on the present status of the 7,000 year old man found in a glacier. (Fraser, MA) 2235-2258 on 6155. (Arnold, VA)

1300 UTC on 5965

BRAZIL: Radio Nova Visao. Portuguese. Music to program comments. Meteorology report to station ID. Brazilian stations audible: **Radio Marumby** 9665 at 1530; **Radio Clube** 15415 at 1540; **Radio Clube Paranaense** 9725 at 1545; **Radio Nova Visao** 11705 at 1900. (Wembagher, ARG)

1423 UTC on 13700

NETHERLANDS: Radio Netherlands. Closeup on quality of food vs large company monopoly in France, Netherlands, and Belgium. (Moser, AL) Feature on progress and improvements in Portugal on 11655 at 1855. (Fraser, MA; Pope, TX; Arnold, VA)

1455 UTC on 4815

CHINA: China Radio Int'l. Closing music from Mongolian service, carrier to 1500 with "East is Red" interval signal. Chinese ID into Russian service. China's **CPBS** noted at 1613 on 5090; 1616 on 5125; 1620 on 5250. (John MacDonald, Poulsbo, WA)

1522 UTC on 4003.5

INDONESIA: (Sulawesi) **RRI-Padang**. Indonesian. Regional music interrupted by sign-off announcement, 1600*. Indo's **RRI-Tanjungkarang (Sumatra)** audible on 1528, with gamelan music, I.S., and newscast. Heard to 1649. (Willi H. Passmann, Muelheim, Germany/Hard Core-DX)

1526 UTC on 9660

PHILIPPINES: Radio Veritas. Russian to Central Asia. Music segments with ID/frequency quote and time check in English. (Stokes Schwartz, Madison, WI)

1815 UTC on 9630

SEYCHELLES: BBC. English lessons to 1830 newscast. **Radio FEBA** in French to Africa on 9500 at 1830-1903*. (Silvi, OH)

1830 UTC on 12095

UNITED KINGDOM: BBC World Service. *Play of the Week-Plantation*, about Pocahontas and Jamestown. (Fraser, MA)

1945 UTC on 4545

KAZAKHSTAN: Radio Almaty. Continuous English music to 2000 ID by lady. National anthem to sign-off. (Mahendra Vaghjee, Rose Hill, Mauritius) **Radio Kazakh** noted on 5905 at 0205 (Wembagher, ARG); 11840 at 0650. (Ormandy, NZ)

2011 UTC on 9540

TURKEY: Voice of Bizarre pseudo-news items, announced as, *As the World Turns* at 2015. Mediterranean style music to ID at 2018. (Fine, VA; Paul Ormandy, NZ) Turkish service on 7185 at 0017, // 9445, 5980, 9460. (Quagliari, NY) VOT programming in English 7300 at 2320. (Fraser, MA; Pope, TX; Arnold, VA)

2254 UTC on 5020

NIGER: LV du Sahel. French. Popular music to 2255, followed by announcer's chat and recitations to 2259. Closing announcement to anthem and 2301*. (Fine, VA)

2300 UTC on 13760

NORTH KOREA: Radio Pyongyang. Report on world celebrations for Kim Jong II's 50th birthday. (Fraser, MA) Noted on 2850, 2055-2100+. (Passmann, Germany; Ormandy, NZ)

2348 UTC on 4939.4

VENEZUELA: Radio Amazonas. Latin music to Spanish advertisements. ID format, SINPO=24343. (Vendhuis, NLD)

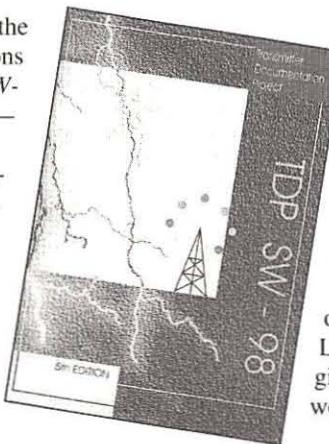
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Detailed information is available about the transmitters used by shortwave radio stations around the world in the fifth edition of *TDP SW-98*—the *Transmitter Documentation Project*—now sporting a color cover and advertising.

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This year's feature articles include, *HF*



Transmission: An Evolutionary Market? by Jeff Cohen from World Radio Network, *Antennas for the Shortwave Broadcaster* by Richard R. Greene from TCI (Technology for Communications International), and *History of Energy-Onix* by Bernard Wise.

TDP is read year after year by radio stations, transmitter manufacturers, radio consultants and engineers, as well as by the dedicated radio hobbyist.

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ASCENSION ISLAND

BBC Atlantic Relay Station, 15400/7325 kHz. Full data verification letter signed by Nicola Nicholls-Transmitter Engineer, plus personal letter and info sheet about the island. Received in 123 days for a taped report. Station address: BBC Atlantic Relay Station, Ascension Island, South Atlantic Ocean. (Walter Szczepaniak, Philadelphia, PA; William R. Wilkins, Springfield, MO)

Voice of America relay, 15225 kHz. Full data Hawaii scenery card unsigned. Received in 21 days for an English report. Station address: 330 Independence Ave., SW, Washington, DC 20547 (Darren R. White, Hattiesburg, MS)

FINLAND

Radio Finland, 11735 kHz. Full data verification letter signed by Raimo Makela, plus station stickers. Received in 47 days for a taped report. Station address: PL 113, 28101 Pori, Finland. (Szczepaniak, PA)

FM/TV

WJBR-FM 99.5. Full data verification letter signed by Dave Banks, plus personal letter and station bumper stickers. Received in 25 days for an FM report. Station address: 3001 Philadelphia Pike, Claymont, DE 19703. (Jose Moura, Washington, DC)

KTXN-FM 98.7. Full data prepared QSL card signed by Peter B. Hoebjena-Chief Engineer. Received in two months for an FM report and mint stamps. Station address: Withers Broadcasting Company of Texas, 3808 N. Navarro, Victoria, TX 77904. (Robert S. Ross, London, ON Canada/AmFmTvDx)

WKOI-TV Ch. 43. Full data prepared QSL signed by Harry J. Monroe-Chief Engineer. Received in two months for a TV report and mint stamps. Station address: Trinity Broadcasting of Indiana, 1702 South 9th St., Richmond, IN 47374. (Ross, CAN)

CHCH-TV Ch. 3. Full data prepared QSL card and personal letter signed by Peter Blockland, plus complete set of color contour maps for all of *On TV's* Ontario transmitters. Received for a TV report and mint stamps. Station address: On TV, P.O. Box 2230 Station A, Hamilton, ON Canada L8N 3A6. (Ross, CAN)

KENYA

KBC, 4935 kHz. Full data prepared card signed by Martin Ouma Ojwach-Engineer in Charge. Personal letter on KBC letterhead enclosed. Received in 87 days for an English report, SAE (used for reply) and one U.S. dollar. Report sent to transmitter site and not to Nairobi office. Station address: KBC Maralal Transmitting Station, P.O. Box 38, Maralal, Kenya. (Randy Stewart, Springfield, MO)

MEDIUM WAVE

WPHG-AM 1620. Frequency only form letter/folder unsigned. Received in 16 days for an English AM report faxed to 334-368-9495. Mailing address: Maranatha Ministries Inc., 805 N. Main St., Atmore, AL 36502. (Stewart, MO)

CKDM-AM 730. Station QSL card unsigned. Received in 17 days for an English AM report and one U.S. dollar. Station address: 273rd Ave., N.E., Dauphin, MB Canada R7N 0Y5 (Patrick Griffith, Federal Heights, CO)

CKTA-AM 1570. Full data prepared card and verification letter signed by Tyler Everitt-Engineer. Received in 60 days for an English AM report and mint stamps. Station address: 401 Mayor Magrath Dr., Lethbridge, AB Canada T1J 3L8. (Terry Jones, Plankinton, SD)

RUSSIA

Voice of Russia, 5940 kHz. Full data QSL card, extra Moscow postcards and letter signed by Eugenia Stepanova. Received in 47 days for an English report. Station address: ul. Pyatnitskaya 25, Moscow. (Ed Luntley, Portland, ME)

SAO TOME

Voice of America relay, 6035 kHz. Full data Hawaii scenery card unsigned. Received in 24 days for a taped report and one U.S. dollar (both returned) Station address: (same as Ascension Island) (Szczepaniak, PA)

SATELLITE SERVICES

Radio Netherlands via U.K.'s World Radio Network One. C-band service-domestic satellite Galaxy 5/transponder 6, audio subcarrier 6.80 MHz. Full data Radio Netherland's station card unsigned, souvenir stickers, two cloth pennants and souvenir postcard. Received in 48 days for one IRC and details of satellite broadcast via WRN's broadcast monitored on home C-band dish. Station address: Radio Netherlands, P.O. Box 222, 1200 JG Hilversum, The Netherlands. (Gayle Van Horn, Brasstown, NC)

SHIP TRAFFIC

Kydonia-P3GB2, 156.600 MHz (Bulk Carrier). Full data prepared QSL card verified and stamped with ship's seal. Received for an English report, one IRC, SAE, mint stamps and one U.S. dollar. Ship address: Marmaras Navigation Ltd., 4-6 Filelinon St., 185 36 Piraeus, Greece. (Russ Hill, Oak Park, MI)

Ziemia Tarnowska-SQND, 156.600 MHz (Bulk Carrier). Full data prepared QSL card verified and stamped with ship's seal. Received for an English report, one IRC, SAE, mint stamps and one U.S. dollar. Ship address: Polish Steamship Co., (Polska Zeglugi Morska) Plac Rodka 8, P.O. Box 527, 70-419 Szczecin, Poland. (Hill, MI)

UNITED STATES

KAJ, 5810 kHz. Full data *Two If By Sea* logo card signed by Fred Bithell. Received in 275 days for an English report and a SASE. Station address: Two if by Sea Broadcasting Corp., 22720 S.E. 410th St., Enumclaw, WA 98022. (White, MS)

USCG CAMSLANT/NMN, 6501 kHz USB. Full data station QSL signed by TCC Thomas F. Sherwood. Received in 16 days for an English report, mint stamps and address label (both used) Station address: Commanding Officer, USCG CAMSLANT, 4720 Milepost Rd., Chesapeake, VA 23322. (Wilkins, MO)

Voice of America-Delano 13740 kHz. Full data *Yellowstone* scenery card unsigned. Received in 24 days for an English report. Station address: (same as Ascension Islands) (White, MS)

HOW TO USE THE SHORTWAVE GUIDE

1: Convert your time to UTC.

Eastern and Pacific Times are already converted to Coordinated Universal Time (UTC) at the top of each page. The rule is: convert your local time to 24-hour format; add (during Daylight Savings Time) 4, 5, 6, or 7 hours for Eastern, Central, Mountain or Pacific Times, respectively.

Note that all dates, as well as times, are in UTC; for example, a show which might air at 0030 UTC Sunday will be heard on Saturday evening in America (8:30 pm Eastern, 5:30 pm Pacific).

2: Choose a program or station you want to hear.

Some selected programs appear on the lower half of the page for prime listening hours—space does not permit 24-hour listings.

Occasionally program listings will be followed by "See X 0000." This information indicates that the program is a rerun, and refers to a previous summary of the program's content. The letter stands for a day of the week, as indicated below, and the four digits represent a time in UTC.

S: Sunday T: Tuesday H: Thursday A: Saturday
M: Monday W: Wednesday F: Friday

3: Find the frequencies for the program or station you want to hear.

Look at the page which corresponds to the time you will be listening. Comprehensive frequency information for English broadcasts can be found at the top half of the page. All frequencies are in kHz.

The frequency listing uses the same day codes as the program listings; if a broadcast is not daily, those day codes will appear before the

station name. Irregular broadcasts are indicated "tent" and programming which includes languages besides English are coded "vl" (various languages).

4: Choose the most promising frequencies for the time, location and conditions.

Not all stations can be heard and none all the time on all frequencies. To help you find the most promising frequency, we've included information on the target area of each broadcast. Frequencies beamed toward your area will generally be easier to hear than those beamed elsewhere, even though the latter will often still be audible. Every frequency is followed by one of these target codes:

am:	The Americas	as:	Asia
na:	North America	au:	Australia
ca:	Central America	pa:	Pacific
sa:	South America	va:	various
eu:	Europe	do:	domestic broadcast
af:	Africa	om:	omnidirectional
me:	Middle East		

Consult the propagation charts. To further help you find the right frequency, we've included charts at the back of this section which take into account conditions affecting the audibility of shortwave broadcasts. Simply pick out the region in which you live and find the chart for the region in which the station you want to hear is located. The chart indicates the optimum frequencies for a given time in UTC.

SWL PROGRAMS

COMPILED BY JIM FRIMMEL

Sundays

0024	Radio Exterior de Espana: "Distance Unknown"
0030	BBC (as): "Write On"
0109	HCJB (am): "DX Partyline"
0124	Radio Exterior de Espana: "Distance Unknown"
0200	Radio For Peace Intl: "World of Radio"
0234	Radio Havana Cuba: "DXers Unlimited"
0258	Vatican Radio: "On-the-Air"
0200	WWCR #3 (Tennessee): "Spectrum"
0305	Australia, Radio: "Feedback"
0323	Voice of Turkey: "DX Corner" (biweekly)
0330	WRMI (Florida): "Wavescan"
0409	HCJB (am): "DX Partyline"
0447	Radio Bulgaria: "Radio Bulgaria Calling"
0500	WRA (Angel 5 Maine): "DXing with Cumbre"
0524	Radio Exterior de Espana: "Distance Unknown"
0530	WHRI (Angel 2 Indiana): "DXing with Cumbre"
0530	Australia, Radio: "Media Report"
0508	Vatican Radio: "On-the-Air"
0634	Radio Havana Cuba: "DXers Unlimited"
0730	KWHR (Angel 4 Hawaii): "DXing with Cumbre"
0630	WWCR #3 (Tennessee): "World of Radio"
0735	Radio Vlaanderen Intl: "Radio World"
0836	Radio Korea: "Multiwave Feedback"
0900	Radio For Peace Intl: "World of Radio"
0905	BBC (at/am/as/eu): "Write On"
0930	WHRI (Angel 2 Indiana): "DXing with Cumbre"
1100	AWR Latin America: "Wavescan"
1115	WWCR #1 (Tennessee): "Ask WWCR"
1138	Radio Korea: "Multiwave Feedback"
1147	Radio Bulgaria: "Radio Bulgaria Calling"
1205	BBC (am/eu): "Write On"
1205	BBC (as): "Write On"
1207	Radio Vlaanderen Intl: "Radio World"
1236	Radio Korea: "Multiwave Feedback"
1300	KWHR (Angel 4 Hawaii): "DXing with Cumbre"

1330	WHRI (Angel 1 Indiana): "DXing with Cumbre"
1230	WRMI (Florida): "Wavescan"
1354	Vatican Radio: "On-the-Air"
1430	WHRI (Angel 1 Indiana): "DXing with Cumbre"
1515	BBC (af): "Waveguide" (4)
1630	KWHR (Angel 3 Hawaii): "DXing with Cumbre"
1635	Radio Vlaanderen Intl: "Radio World"
1636	Radio Korea: "Multiwave Feedback"
1705	BBC (as): "Write On"
1735	Radio Vlaanderen Intl: "Radio World"
1830	KWHR (Angel 3 Hawaii): "DXing with Cumbre"
1830	WHRI (Angel 2 Indiana): "DXing with Cumbre"
1936	Radio Korea: "Multiwave Feedback"
2030	WRMI (Florida): "Wavescan"
2105	BBC (am/eu): "Write On"
2130	KWHR (Angel 4 Hawaii): "DXing with Cumbre"
2130	WRA (Angel 5 Maine): "DXing with Cumbre"
2135	BBC (af): "Write On"
2136	Radio Korea: "Multiwave Feedback"
2300	KSDA (Guam): "Wavescan"
2300	Radio For Peace Intl: "World of Radio"
2330	Australia, Radio: "Media Report"

Mondays

0106	Deutsche Welle: "World DX Meeting" (4/5)
0230	Radio Korea: "Multiwave Feedback"
0305	BBC (af/am/eu): "Write On"
0330	KWHR (Angel 4 Hawaii): "DXing with Cumbre"
0430	Radio New Zealand Intl: "Mailbox" (1/3)
0400	WWCR #1 (Tennessee): "Spectrum"
0400	WWCR #3 (Tennessee): "World of Radio"
0430	WWCR #3 (Tennessee): "Ask WWCR"
0700	Radio For Peace Intl: "World of Radio"
1040	All India Radio: "DX-ers Corner" (2/4)

1130	Radio New Zealand Intl: "Mailbox" (1/3)
1615	KTWR (Guam): "Pacific DX Report"
1840	All India Radio: "DX-ers Corner" (2/4)
2130	All India Radio: "DX-ers Corner" (2/4)
2100	WWCR #1 (Tennessee): "Ask WWCR"

Tuesdays

0030	BBC (as): "Waveguide" (4)
0900	KTWR (Guam): "Pacific DX Report"
1246	Radio Sweden: "MediaScan" (1/3)
1230	WWCR #1 (Tennessee): "World of Radio"
1346	Radio Sweden: "MediaScan" (1/3)
1355	FBC (Philippines): "DX Dial"
1746	Radio Sweden: "MediaScan" (1/3)
1900	Radio For Peace Intl: "World of Radio"
2000	Polish Radio: "Polish Radio DX Club"
2111	Radio Havana Cuba: "DXers Unlimited"
2311	Radio Havana Cuba: "DXers Unlimited"
2340	All India Radio: "DX-ers Corner" (2/4)

Wednesdays

0140	Radio Havana Cuba: "DXers Unlimited"
0146	Radio Sweden: "MediaScan" (1/3)
0246	Radio Sweden: "MediaScan" (1/3)
0300	Radio For Peace Intl: "World of Radio"
0335	Radio Havana Cuba: "DXers Unlimited"
0346	Radio Sweden: "MediaScan" (1/3)
0535	Radio Havana Cuba: "DXers Unlimited"
0730	HCJB (eu): "Ham Radio Today"
0730	BBC (af): "Waveguide" (4)
0930	HCJB (pac): "Ham Radio Today"
1000	Radio For Peace Intl: "World of Radio"
1315	FBC (Philippines): "DX Dial"
1720	Polish Radio: "Polish Radio DX Club"
1820	Argentina, RAE: "DXers Special"
1930	Radio For Peace Intl: "Continent of Media"

1930	Radio New Zealand Intl: "Mailbox" (1/3)
1947	Radio Bulgaria: "Radio Bulgaria Calling"
2000	Radio For Peace Intl: "World of Radio"
2000	WWCR #1 (Tennessee): "Ask WWCR"
2105	Australia, Radio: "Feedback"
2238	Voice of Turkey: "DX Corner" (biweekly)
2344	Radio Bulgaria: "Radio Bulgaria Calling"

Saturdays

0010	Australia, Radio: "Feedback"
0100	WRMI (Florida): "Wavescan"
0230	KWHR (Angel 3 Hawaii): "DXing with Cumbre"
0330	Radio For Peace Intl: "Continent of Media"
0338	Voice of Turkey: "DX Corner" (biweekly)
0400	Radio For Peace Intl: "World of Radio"
0600	WHRI (Angel 1/2 Indiana): "DXing with Cumbre"

(Continued on P. 42)

FREQUENCIES

0000-0100	Anguilla, Caribbean Beacon	6090am				0000-0100	Ukraine, R Ukraine Intl	5915na	5940eu	6020eu	6050eu
0000-0100	Australia, Radio	9660pa	12080pa	13605pa	13755pa	0000-0100	USA, KAIJ Dallas TX	5810am			
		15510pa	17750as	17795pa		0000-0100	USA, KHBI N Mariana Is	15665as			
0000-0100 vl	Australia, VL8K Katherine	5025do				0000-0100	USA, KTBW Salt Lk City UT	7420eu	7150na	7205na	7290eu
0000-0100 vl	Australia, VL8T Tent Crk	4910do				0000-0100	USA, KWHR Naalehu HI	17510as	17555pa		
0000-0100	Canada, CBC N Quebec Svc	9625do				0000-0100	USA, Voice of America	7215as	9890as	11760as	15185as
0000-0100	Canada, CFRX Toronto	6070do				0000-030 twhfa	USA, Voice of America	15290as	17735as	17820as	
0000-0100	Canada, CFVP Calgary	6030do				0000-0100	USA, WEWN Birmingham AL	9595am	6130ca	7405am	9455am
0000-0100	Canada, CHNX Halifax	6130do				0000-0100	USA, WGTO McCaysville GA	9775am	11695am	13740am	
0000-0100	Canada, CKZN St John's	6160do				0000-0100	USA, WHRI Noblesville IN	5825eu			
0000-0100	Canada, CKZU Vancouver	6160do				0000-0100	USA, WINB Red Lion PA	5085am			
0000-0029	Canada, R Canada Intl	5960na	6040na	9535na	9755na	0000-0100	USA, WJCR Upton KY	5745am			
		11865am				0000-0100	USA, WRMU/R Miami Intl	7315am			
0000-0027	Czech Rep, Radio Prague	5930na	7345na			0000-0100	USA, WRMU/R Miami Intl	9955am			
0000-0100	Ecuador, HCJB	9745na	21455am			0000-030 a	USA, WRNO New Orleans LA	9955am			
0000-0030	Egypt, Radio Cairo	9900na				0000-0100	USA, WSHB Cypress Crk SC	7355am			
0000-0100	Germany, Overcomer Minist	5840na				0000-059 mwlf	USA, WSHB Cypress Crk SC	9430am			
0000-0015 vl	Ghana, Ghana Broadc Corp	3366do	4915do			0000-059 smwfa	USA, WSHB Cypress Crk SC	7535na			
0000-0045	India, All India Radio	7410as	9705as	9950as	11620as	0000-0100	USA, WWCR Nashville TN	3215am	5070am	7435am	13845am
0000-0015	Japan, R Japan/NHK World	6155eu	6180eu	9665af	11705na	0000-0100	USA, WYFR Okeechobee FL	6085na	9505ca	15440na	
		11815as	13650as			0015-0100	Japan, R Japan/NHK World	6155eu	6180eu	9665af	11705na
0000-0100	Liberia, LCN/R Liberia Int	5100do				0029-059	Canada, R Canada Intl	5960na	9755na		
0000-0100	Malaysia, Radio	7295do				0030-0100	Iran, VOIRI	6055eu	9022eu	9685eu	
0000-0030	Netherlands, Radio	6020na	6165na	9845na		0030-0100	Lithuania, Radio Vilnius	5950na			
0000-0100	New Zealand, R NZ Intl	17675pa				0030-0100	Netherlands, Radio	6020na	6165na	9845na	9855na
0000-0100	North Korea, R Pyongyang	11845ca	13650sa	15230na		0030-0100	Sri Lanka, Sri Lanka BC	9730as	15425as		
0000-0100 vl	Papua New Guinea, NBC	9675do				0030-0100	Thailand, Radio	9655as	13695na	15395as	
0000-0030 mtwhfa	Serbia, Radio Yugoslavia	6195na	7115na			0030-0100	UK, BBC Asian Service	5965as	6080as	6195as	9410as
0000-0100	Singapore, SBC Radio One	6160do				0045-0100	USA, WYFR Okeechobee FL	11955as	15310as	15360as	
0000-0100 vl	Solomon Islands, SIBC	5020do				0050-0100	Italy, RAI Intl	7520na			
0000-0100	Spain, R Exterior Espana	6055am				0050-0100	Italy, RAI Intl	6010na	9675na	11800na	
0000-0030	Thailand, Radio	9655af	9680af	11905af							
0000-030	UK, BBC Asian Service	3915as	6195as	7110as	9410as						
		9580as	11945as	11955as	15280as						
0000-0100	UK, BBC World Service	5970sa	5975am	6175na	9590am						
		9915sa	11750sa								

SELECTED PROGRAMS

Sundays

0000 UK, BBC London (am/eu/as): Newsdesk. World news and dispatches from overseas and UK correspondents.
 0030 UK, BBC London (am/eu): Letter from America. Alistair Cooke shares his inimitable view of contemporary American life.
 0030 UK, BBC London (as): Write On. Air your views about World Service; write to PO Box 76, Bush House, Strand, London WC2B 4PH.
 0040 UK, BBC London (as): Science View. A look at complex issues and the implications of the latest research findings.
 0045 UK, BBC London (am/eu/as): Britain Today. News about Britain.

Mondays

0000 UK, BBC London (am/eu): Chimes of Big Ben (1). Hear the famous bells at that time on the first Monday of each month.
 0000 UK, BBC London (am/eu/as): Newsdesk. See S 0000.
 0030 UK, BBC London (am/eu): Westway Access. Explaining the soap opera as an English learning tool.
 0030 UK, BBC London (as): Variable Feature. See S 0130.
 0045 UK, BBC London (am/eu/as): Britain Today. See S 0045.

Tuesdays

0000 UK, BBC London (am/eu/as): Newsdesk. See S 0000.
 0000 USA, VOA Washington DC (ca): VOA News. Ten minutes of worldwide news on the hour.
 0010 USA, VOA Washington DC (am): VOA Business Report. A weekday review of business and financial matters.
 0010 USA, VOA Washington DC (ca): American Gold. Fifty minutes of classic pop music hosted by Ray Freeman.
 0030 UK, BBC London (am/eu): Westway. See M 0330.
 0030 UK, BBC London (as): Variable Feature. See S 0130.
 0030 UK, BBC London (as): Waveguide (4). See S 1515.
 0030 USA, VOA Washington DC (am): News (Special English). Ten minutes of news in slow English.
 0040 USA, VOA Washington DC (am): Agriculture Report (Special English). Developments and reports on farming and agriculture.
 0045 UK, BBC London (am/eu/as): Britain Today. See S 0045.

0045 USA, VOA Washington DC (am): Science in the News (Special English). Recent scientific developments.

Wednesdays

0000 UK, BBC London (am/eu/as): Newsdesk. See S 0000.
 0000 USA, VOA Washington DC (ca): VOA News. See Carib 0000.
 0010 USA, VOA Washington DC (am): VOA Business Report. See Am Reps 0010.
 0010 USA, VOA Washington DC (ca): Report to the Caribbean. The latest news affecting the region, as well as a roundup of sports, financial news, and the weather forecast.
 0030 UK, BBC London (am/eu): The Farming World. See S 0815.
 0030 UK, BBC London (as): Variable Feature. See S 0130.
 0030 USA, VOA Washington DC (am): News (Special English). See Am Reps 0030.
 0030 USA, VOA Washington DC (ca): Studio 38. A bright, fast-paced show highlighting American lifestyles and culture.
 0040 USA, VOA Washington DC (am): Science Report (Special English). Developments in the world of science and technology.
 0045 UK, BBC London (am/eu/as): Britain Today. See S 0045.
 0045 USA, VOA Washington DC (am): Exploration (Special English). NEW! Steve Ember and Shirley Griffith report on space news.

Thursdays

0000 UK, BBC London (am/eu/as): Newsdesk. See S 0000.
 0000 UK, BBC London (as): Chimes of Big Ben (1). See M 0000.
 0000 USA, VOA Washington DC (ca): VOA News. See Carib 0000.
 0010 USA, VOA Washington DC (am): VOA Business Report. See Am Reps 0010.
 0010 USA, VOA Washington DC (ca): Report to the Caribbean. See Carib 0010.
 0030 UK, BBC London (am/eu/as): From Our Own Correspondent. See S 0330.
 0030 USA, VOA Washington DC (am): News (Special English). See Am Reps 0030.
 0030 USA, VOA Washington DC (ca): Studio 38. See Carib 0030.
 0040 USA, VOA Washington DC (am): Science Report (Special English). See Am Reps 0040.
 0045 UK, BBC London (am/eu/as): Britain Today. See S 0045.
 0045 USA, VOA Washington DC (am): American Mosaic (Special English). Reports about music, books, movies, and student life in the USA.

Fridays

0045 USA, VOA Washington DC (am): The Making of a Nation (Special English). Chapters from U.S. history in special English.
 0000 UK, BBC London (am/eu/as): Newsdesk. See S 0000.
 0000 USA, VOA Washington DC (ca): VOA News. See Carib 0000.
 0010 USA, VOA Washington DC (am): VOA Business Report. See Am Reps 0010.
 0010 USA, VOA Washington DC (ca): Report to the Caribbean. See Carib 0010.
 0030 UK, BBC London (am/eu): Westway. See M 0330.
 0030 UK, BBC London (as): Short Story. See S 0715.
 0030 USA, VOA Washington DC (am): News (Special English). See Am Reps 0030.
 0030 USA, VOA Washington DC (ca): Studio 38. See Carib 0030.
 0040 USA, VOA Washington DC (am): Environment Report (Special English). A five-minute report on a specific environmental subject.
 0045 UK, BBC London (am/eu/as): Britain Today. See S 0045.
 0045 USA, VOA Washington DC (am): American Mosaic (Special English). Reports about music, books, movies, and student life in the USA.

Saturdays

0000 UK, BBC London (am/eu/as): Newsdesk. See S 0000.
 0000 USA, VOA Washington DC (ca): VOA News. See Carib 0000.
 0010 USA, VOA Washington DC (am): VOA Business Report. See Am Reps 0010.
 0010 USA, VOA Washington DC (ca): Report to the Caribbean. See Carib 0010.
 0030 UK, BBC London (am/eu/as): From the Weeklies. Review of the British weekly press.
 0030 USA, VOA Washington DC (am): News (Special English). See Am Reps 0030.
 0030 USA, VOA Washington DC (ca): Studio 38. See Carib 0030.
 0040 USA, VOA Washington DC (am): Environment Report (Special English). See Am Reps 0040.
 0045 UK, BBC London (am/eu/as): Britain Today. See S 0045.
 0045 USA, VOA Washington DC (am): American Mosaic (Special English). See Am Reps 0045.

FREQUENCIES

0100-0200	Anguilla, Caribbean Beacon	6090am				0100-0130	Slovakia, R Slovakia Intl	5930na	7300af	9440sa
0100-0200	Australia, Radio	9660pa	12080pa	13605pa	15240pa	0100-0200 vi	Solomon Islands, SIBC	5020do		
		15415as	15510pa	17750pa	17795pa	0100-0200	South Korea, R Korea Intl	7275as	11725am	11810am
0100-0200 vi	Australia, VL8K Katherine	5025do				0100-0200	Spain, R Exterior Espana	6055am		15575am
0100-0200 vi	Australia, VL8T Tent Crk	4910do				0100-0200	Sri Lanka, Sri Lanka BC	9730as		
0100-0200	Canada, CBC N Quebec Svc	9625do				0100-0200	Sweden, Radio	11985as		
0100-0200	Canada, CFRX Toronto	6070do				0100-0200	Switzerland, Swiss R Intl	9985na	9905ca	
0100-0200	Canada, CFVP Calgary	6030do				0100-0200	UK, BBC Asian Service	5965as	6195as	9410as
0100-0200	Canada, CHNX Halifax	6130do				0100-0200	UK, BBC World Service	15280as	15310as	11955as
0100-0200	Canada, CKZN St John's	6160do				0100-0200	UK, BBC World Service	5970sa	5975am	6175na
0100-0200	Canada, CKZU Vancouver	6160do				0100-0200	USA, KAIJ Dallas TX	9915sa	11750sa	
0100-0200	Costa Rica, RF Peace Intl	7385am	15050am			0100-0200	USA, KJES Mesquite NM	5810am		
0100-0105	Croatia, Croatian Radio	5840am				0100-0200	USA, KTBN Salt Lk City UT	7555am		
0100-0200	Cuba, Radio Havana	6000na	9820na	9830na		0100-0200	USA, KWHR Naalehu HI	7510am		
0100-0127	Czech Rep, Radio Prague	6200na	7345na			0100-0200	USA, Voice of America	17510as	17555pa	
0100-0200	Ecuador, HCJB	9745na	21455am			0100-0200	USA, Voice of America	7115as	7205as	9740as
0100-0150	Germany, Deutsche Welle	6040na	6085na	6145na	9640na	0100-0200	USA, Voice of America	11705as	15250as	9850as
0100-0200	Germany, Overcomer Ministr	5840na				0100-0200	USA, Voice of America	17820as		
0100-0115	Ghana, Ghana Broad Corp	3366do	4915do			0100-0200	USA, Voice of America	5995am	6130am	7405am
0100-0130	Hungary, Radio Budapest	6120na	9580na			0100-0200	USA, WEWN Birmingham AL	9755am	13740am	
0100-0200	Indonesia, Voice of	11785as				0100-0200	USA, WGTC McCaysville GA	5825eu		
0100-0125	Iran, VOIRI	6055eu	9022eu	9685eu		0100-0200	USA, WHRI Noblesville IN	5085am		
0100-0110	Italy, RAI Intl	6010na	9675na	11800na		0100-0200	USA, WINB Red Lion PA	5745am	7315am	
0100-0200	Japan, R Japan/NHK World	6150af	11860as	11870af	15570as	0100-0200	USA, WJCR Upton KY	7490na		
		15590as	17810as	17835sa	21610pa	0100-0200	USA, WRMI/R Miami Intl	9955am		
		21670pa				0100-0200	USA, WRNO New Orleans LA	7355am		
0100-0200	Liberia, LCN/R Liberia Int	5100do				0100-0159 m	USA, WSHB Cypress Crk SC	9430am		
0100-0200	Malaysia, Radio	7295do				0100-0159	USA, WSHB Cypress Crk SC	7535na		
0100-0125	Netherlands, Radio	6020na	6165na	9845na	9855as	0100-0200	USA, WWCR Nashville TN	3215am	5070am	5935am
0100-0200	New Zealand, R NZ Intl	17675pa				0100-0200	USA, WYFR Okeechobee FL	6065na	7520as	9505na
0100-0130 m	Norway, Radio Norway Intl	7465na	7545am			0100-0130	Uzbekistan, R Tashkent	5040eu	5955eu	11550as
0100-0200 vl	Papua New Guinea, NBC	9675do				0100-0127	Vietnam, Voice of	7205eu	9540eu	7105eu
0100-0200	Philippines, FEBC/R Intl	15450as				0115-0200 m	USA, WRMI/R Miami Intl	5940am		
0100-0200	Russia, Voice of Russia WS	5930na	7105na	7345na	9580na	0125-0200	USA, Netherlands, Radio	9955am		
		12030na	13665na			0130-0200	Austria, R Austria Intl	9855as	11655as	12090as
0100-0200 mthwfa	Russia, Voice of Russia WS	5920na				0130-0150	Greece, Voice of	7325na	9495am	9870am
0100-0130	Serbia, Radio Yugoslavia	6180na	7130na			0130-0200	Guam, AWR/KSDA	6260na	7450na	9420na
0100-0200	Singapore, SBC Radio One	6160do				0140-0200	Vatican State, Vatican R	5980au	7335au	9935na

SELECTED PROGRAMS

Sundays

0100 UK, BBC London (am/eu): Newsdesk. See S 0000.
0100 UK, BBC London (as): World News. Broadcast on the hour of 5, 10, or 15 minutes in length.
0110 UK, BBC London (as): Pause for Thought. Spiritual reflection.
0115 UK, BBC London (as): Health Matters. Keeps track of new developments in the world of medical science, as well as ways of keeping fit.
0130 UK, BBC London (am/eu): Variable Feature. Special features and new series.
0130 UK, BBC London (as): World News. See S 0100.
0145 UK, BBC London (am/eu/as): Sports Roundup. The latest sports news.

Mondays

0100 UK, BBC London (am/eu): Newsdesk. See S 0000.
0100 UK, BBC London (as): World News. See S 0100.
0110 UK, BBC London (as): Pause for Thought. See S 0110.
0115 UK, BBC London (as): The Farming World. See S 0815.
0130 UK, BBC London (am/eu): Pick of the World. Daire Brehan celebrates the diversity and range of BBC output by picking her favorite choice from the previous week for you to hear again.
0130 UK, BBC London (as): World News. See S 0100.
0145 UK, BBC London (as): Sports Roundup. See S 0145.

Tuesdays

0100 UK, BBC London (am/eu): Newsdesk. See S 0000.
0100 UK, BBC London (as): World News. See S 0100.
0110 UK, BBC London (as): Pause for Thought. See S 0110.
0115 UK, BBC London (as): Insight. See M 1645.
0130 UK, BBC London (am/eu): Seven Days. See M 0615.
0130 UK, BBC London (as): World News. See S 0100.
0145 UK, BBC London (am/eu): Variable Feature. See S 0130.
0145 UK, BBC London (as): Sports Roundup. See S 0145.

Wednesdays

0100 UK, BBC London (am/eu): Newsdesk. See S 0000.
0100 UK, BBC London (as): World News. See S 0100.
0110 UK, BBC London (as): Pause for Thought. See S 0110.

0115 UK, BBC London (as): Insight. See M 1645.
0130 UK, BBC London (am/eu): Discovery. See T 0230.
0130 UK, BBC London (as): World News. See S 0100.
0145 UK, BBC London (as): Sports Roundup. See S 0145.

Thursdays

0100 UK, BBC London (am/eu): Newsdesk. See S 0000.
0100 UK, BBC London (as): World News. See S 0100.
0110 UK, BBC London (as): Pause for Thought. See S 0110.
0115 UK, BBC London (as): Insight. See M 1645.
0130 UK, BBC London (am/eu): Omnibus. See S 1715.
0130 UK, BBC London (as): World News. See S 0100.
0145 UK, BBC London (as): Sports Roundup. See S 0145.

Fridays

0100 UK, BBC London (am/eu): Newsdesk. See S 0000.
0100 UK, BBC London (as): World News. See S 0100.

0110 UK, BBC London (as): Pause for Thought. See S 0110.
0115 UK, BBC London (as): Insight. See M 1645.
0130 UK, BBC London (am/eu): Composer of the Month. See M 1930.
0130 UK, BBC London (as): World News. See S 0100.
0145 UK, BBC London (as): Sports Roundup. See S 0145.

Saturdays

0100 UK, BBC London (am/eu): Newsdesk. See S 0000.
0100 UK, BBC London (as): World News. See S 0100.
0110 UK, BBC London (as): Insight. See M 1645.
0110 UK, BBC London (as): Pause for Thought. See S 0110.
0130 UK, BBC London (am/eu): Variable Feature. See S 0130.
0130 UK, BBC London (as): World News. See S 0100.
0145 UK, BBC London (am/eu): Short Story. See S 0715.
0145 UK, BBC London (as): Sports Roundup. See S 0145.

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THANK YOU...

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Joe Brasier/WHRI; Bob Fraser, Cohasset, MA; Glenn Hauser, Enid, OK/; DX Report & WOR; Jim Moats, Ravenna, OH; Adrian Sandsbury/Larry Van Horn, Brasstown, NC/Satellite Times; George Woods/R. Sweden 's Media Scan; R NZ Intl; BBCMS/World Media; Cumbre DX; DX Ontario; NASWA Journal; Usenet newsgroups.

FREQUENCIES

0200-0300	Anguilla, Caribbean Beacon	6090am			0200-0300	Taiwan, Radio Taipei Intl	5950na	7130as	9680na	11740am
0200-0300 twhfa	Argentina, RAE	11710am			0200-0300	UK, BBC African Service	11750as	11825pa	15345as	
0200-0300	Australia, Radio	9660pa	12080pa	13605pa	0200-0300	UK, BBC Asian Service	6050af	6135af	7125af	9610af
0200-0300 vl	Australia, VL8K Katherine	15415as	15510pa	17750as	0200-0300	UK, BBC Asian Service	9410as	9605as	9825as	11760as
0200-0300 vl	Australia, VL8T Tent Crk	5025do			0200-0300	UK, BBC World Service	11955as	15280as	15310as	15360as
0200-0210	Bangladesh, Bangla Betar	4910do			0200-0300	USA, KAJ Dallas TX	5970sa	5975am	6175na	9590am
0200-0300	Bulgaria, Radio	4880do			0200-0300	USA, KTBW Salt Lk City UT	5810am			
0200-0300	Canada, CBC N Quebec Svc	9485na	11720na		0200-0300	USA, KVOH Los Angeles CA	7510am			
0200-0300	Canada, CFRX Toronto	9625do			0200-0300	USA, KWHR Naaehu HI	9975am			
0200-0300	Canada, CFVP Calgary	6070do			0200-0300	USA, Voice of America	17510as	17555pa	7205as	9740as
0200-0300	Canada, CHNX Halifax	6030do			0200-0300	USA, Voice of America	7115as	7205as	9740as	9850as
0200-0300	Canada, CKZN St John's	6130do			0200-0300	USA, WENW Birmingham AL	11705as	15250as	15300as	17740as
0200-0300	Canada, CKZU Vancouver	6160do			0200-0300	USA, WGTG McCaysville GA	17820as			
0200-0259	Canada, R Canada Intl	6155am	9535am	9755am	0200-0300	USA, WHRI Noblesville IN	5825eu			
0200-0300	Costa Rica, RF Peace Intl	11865am			0200-0300	USA, WINB Red Lion PA	5085am			
0200-0205	Croatia, Croatian Radio	7385am	15050am		0200-0300	USA, WJCR Upton KY	5745am			
0200-0300	Cuba, Radio Havana	5840am			0200-0300	USA, WRMI/R Miami Intl	7315am			
0200-0300	Ecuador, HCJB	6000na	9820na	9830na	0200-0300	USA, WRNO New Orleans LA	9955am			
0200-0300	Egypt, Radio Cairo	9745na	21455am		0200-0300	USA, WSHB Cypress Crk SC	7355am			
0200-0230	Finland, YLE/R Finland	9780na	11900na		0200-0300	USA, WSHB Cypress Crk SC	5850na			
0200-0250	Germany, Deutsche Welle	7285as	9615as	9690as	0200-0259 m	USA, WSHB Cypress Crk SC	7535na			
0200-0300	Germany, Overcomer Ministr	11965as	12045as		0200-0300	USA, WWCR Nashville TN	3215am	5070am	5935am	7435am
0200-0300 as/vl	Italy, IRRS	5880na	7335na		0200-0300	USA, WYFR Okeechobee FL	6065na	9505na		
0200-0300 vl	Kenya, Kenya Broad Corp	7120va			0215-0220	Nepal, Radio	3230do	5005do		
0200-0300	Malaysia, Radio	4885do	4935do	6150do	0225-0300	Netherlands, Radio	9855as	11655as		
0200-0225	Netherlands, Radio	7295do			0230-0300	Hungary, Radio Budapest	9840na	11900na		
0200-0300	New Zealand, R NZ Intl	9855as	11655as	12090as	0230-0245	Pakistan, Radio	6070as	7485as	11760as	13610as
0200-0230 m	Norway, Radio Norway Intl	17675pa			0230-0300	Sweden, Radio	15485as			
0200-0300 vl	Papua New Guinea, NBC	7565am			0230-0300	UK, BBC World Service	7135na	9495na		
0200-0300	Philippines, FEBC/R Intl	9675do			0230-0300	Vietnam, Voice of	9895am			
0200-0256	Romania, R Romania Intl	15450as			0245-0300	Albania, R Tirana Intl	5940am			
0200-0300	Russia, Voice of Russia WS	6155na	7195na	9510na	0245-0300	UK, BBC World Service	6115na	7160na		
0200-0300	Russia, Voice of Russia WS	9690as	11940na	9570na	0245-0300 vl	Zambia, R Zambia/ZNBC 2	5995am	6110am	6190ca	9515am
0200-0300 mtwhfa	Singapore, SBC Radio One	7175na	5920na	7345na	0250-0300 sf	Greece, Voice of	6260na	7450na	9420na	9935na
0200-0300	Solomon Islands, SIBC	6160do			0250-0300	Vatican State, Vatican R	6095am	7305ca		
0200-0300	Sri Lanka, Sri Lanka BC	5020do			0255-0300 vl	Zambia, R Zambia/ZNBC 1	4910do			

SELECTED PROGRAMS

Sundays

0200 UK, BBC London (af/am/as/eu): Newsday. Coverage of the breaking stories and a background briefing on the main news issues of the day.
 0230 UK, BBC London (af): In Praise of God. Weekly programme of worship and meditation.
 0230 UK, BBC London (am/eu): Music Review. News and views from the world of music.
 0230 UK, BBC London (as): Letter from America. See S 0030.
 0245 UK, BBC London (as): Variable Feature. See S 0130.
 0250 Vatican State, Vatican Radio: With Heart and Mind. How this week's liturgical readings apply to our everyday lives.
 0258 Vatican State, Vatican Radio: On-the-Air. A preview of upcoming programs and broadcast changes and a look behind-the-scenes at Vatican Radio.

Mondays

0200 UK, BBC London (af/am/as/eu): Newsday. See S 0200.
 0230 UK, BBC London (af): Pop Science. See S 1730.
 0230 UK, BBC London (am/eu): Meridian. See S 0630.
 0230 UK, BBC London (as): The Works. Alun Lewis looks at the impact of tomorrow's technology.
 0250 Vatican State, Vatican Radio: And So They Came to Rome. The people who have come to the eternal city over the years.

Tuesdays

0200 UK, BBC London (af/am/as/eu): Newsday. See S 0200.
 0230 UK, BBC London (af): Variable Feature. See S 0130.
 0230 UK, BBC London (am/eu): Meridian On Screen. See M 1930.
 0230 UK, BBC London (as): Discovery. In-depth look at scientific research.
 0245 UK, BBC London (af): Seven Days. See M 0615.
 0250 Vatican State, Vatican Radio: A Room with a View of the Vatican. A look at the activities of the Catholic Church in Rome.
 0255 Vatican State, Vatican Radio: As Romans Turn. Focusing on out-of-the-way religious and other events in the eternal city.

Wednesdays

0200 UK, BBC London (af/am/as/eu): Newsday. See S 0200.
 0230 UK, BBC London (af): The Farming World. See S 0815.
 0230 UK, BBC London (am/eu): Meridian. See S 0630.
 0230 UK, BBC London (as): One Planet. See T 1830.
 0245 UK, BBC London (af): Record News. See S 0815.
 0250 Vatican State, Vatican Radio: The Rome Report. A behind the scenes review of issues currently confronting the church and the world.

Thursdays

0200 UK, BBC London (af/am/as/eu): Newsday. See S 0200.
 0230 UK, BBC London (af): Assignment. A weekly examination of a topical issue.
 0230 UK, BBC London (am/eu): Meridian. See S 0630.
 0230 UK, BBC London (as): Variable Feature. See S 0130.
 0250 Vatican State, Vatican Radio: The Pope and the People. Recent public statements by the Pope and responses from the man on the street.
 0254 Vatican State, Vatican Radio: Pilgrim City. A look at those been to Rome recently.

Fridays

0200 UK, BBC London (af/am/as/eu): Newsday. See S 0200.
 0230 UK, BBC London (af): Variable Feature. See S 0130.
 0230 UK, BBC London (am/eu): Focus on Faith. Alison Hilliard talks to church leaders about their hopes for the future.
 0230 UK, BBC London (as): Assignment. See H 0230.
 0250 Vatican State, Vatican Radio: Then and Now. Whatever happened to yesterday's headlines?

Saturdays

0200 UK, BBC London (af/am/as/eu): Newsday. See S 0200.
 0230 UK, BBC London (af/am/as/eu): People and Politics. See F 2130.
 0250 Vatican State, Vatican Radio: Echoes of an Era. The Popes in the twentieth century remembered by those who knew them.

(Saturdays, continued from p. 39)

0600 WWCR #1/3 (Tennessee): "World of Radio"
 0605 Australia, Radio: "Feedback"
 0709 HCJB (eu): "DX Partyline"
 0800 KWHR (Angel 4 Hawaii): "DXing with Cumbre"
 0909 HCJB (pac): "DX Partyline"
 0940 FEBC (Philippines): "DX Dial"
 0940 KTWR (Guam): "Pacific DX Report"
 0915 WWCR #3 (Tennessee): "Ask WWCR"
 1030 Voice of America (as pac): "Communications World"
 1030 Radio For Peace Intl: "Continent of Media"
 1100 Radio For Peace Intl: "World of Radio"
 1130 KWHR (Angel 3 Hawaii): "DXing with Cumbre"
 1147 Radio Bulgaria: "Radio Bulgaria Calling"
 1230 Voice of America (as pac): "Communications World"
 1130 WWCR #3 (Tennessee): "World of Radio"
 1245 Voice of Turkey: "DX Corner" (biweekly)
 1342 Radio Tashkent: "Radio Tashkent DX Program"
 1455 FEBC (Philippines): "DX Dial"
 1530 WHRI (Angel 2 Indiana): "DXing with Cumbre"
 1730 Voice of America (af/as/eu/me): "Communications World"
 1800 Radio For Peace Intl: "World of Radio"
 1830 WHRI (Angel 1 Indiana): "DXing with Cumbre"
 1909 HCJB (eu): "DX Partyline"
 1915 Voice of Turkey: "DX Corner" (biweekly)
 2000 KWHR (Angel 4 Hawaii): "DXing with Cumbre"
 2030 WWCR #3 (Tennessee): "Ask WWCR"
 2058 Vatican Radio: "On-the-Air"
 2114 Radio Havana Cuba: "DXers Unlimited"
 2130 Voice of America (af/eu/me): "Communications World"
 2143 Radio Bulgaria: "Radio Bulgaria Calling"
 2223 Voice of Turkey: "DX Corner" (biweekly)
 2130 WRMI (Florida): "Wavescan"
 2124 Radio Exterior de Espana: "Distance Unknown"
 2300 WHRI (Angel 2 Indiana): "DXing with Cumbre"
 2300 Vatican Radio: "On-the-Air"
 2300 WRMI (Florida): "Wavescan"
 2300 KSDA (Guam): "Wavescan"
 2306 Radio Havana Cuba: "DXers Unlimited"

FREQUENCIES

0300-0400	Anguilla, Caribbean Beacon	6090am			0300-0330	UK, BBC African Service	3255af	6005af	6135af	6190af	
0300-0400	Australia, Radio	9660pa	12080pa	13605pa	15240pa	0300-0330	UK, BBC Asian Service	9600af	15310as	15360as	17790as
0300-0400	Australia, VL8K Katherine	15415as	15510pa	17750pa	17795pa	0300-0330	UK, BBC World Service	9605as	1575am	6175na	6195eu
0300-0400	Australia, VL8T Tent Crk	5025do				0300-0400	Ukraine, R Ukraine Intl	21660as	5970sa	5975am	6195eu
0300-0400	Australia, DefenseForces R	4910do				0300-0400	USA, KALU Dallas TX	12095af	9895am	11760me	11850as
0300-0330	Canada, Can Forces Net	15635as				0300-0400	USA, KTBW Salt Lk City UT	15280as	15340as	17555pa	11905eu
0300-0400	Canada, CBC N Quebec Svc	6155ca	9755ca	9780ca		0300-0400	USA, KVOH Los Angeles CA	6020eu	7150na	7205eu	11905eu
0300-0400	Canada, CFRX Toronto	9625do				0300-0400	USA, KWHR Naalehu HI	5810am	17510as	17555pa	7105af
0300-0400	Canada, CFVP Calgary	6070do				0300-0400	USA, Voice of America	9975am	6080af	6115af	7105af
0300-0400	Canada, CHNX Halifax	6130do				0300-0400	USA, Voice of America	7290af	7340af	9575af	9885af
0300-0400	Canada, CKZN St John's	6160do				0300-0400	USA, Voice of America	7415af			
0300-0400	Canada, CKZU Vancouver	6160do				0300-0400	USA, WEWN Birmingham AL	4960af			
0300-0359	Canada, R Canada Intl	6155am	9755am	9780am		0300-0400	USA, WGTG McCaysville GA	5825eu			
0300-0329	Canada, R Canada Intl	9690na				0300-0400	USA, WHRA Greenbush ME	5085am			
0300-0400	China, China Radio Intl	9690na				0300-0400	USA, WHRI Noblesville IN	9400me			
0300-0400	Costa Rica, Faro del Carib	5055do				0300-0400	USA, WINB Red Lion PA	5745am	7315am		
0300-0400	Costa Rica, RF Peace Intl	7385am	15050am			0300-0400	USA, WJCR Upton KY	11950am			
0300-0400	Cuba, Radio Havana	6000na	9820na	9830na		0300-0400	USA, WMLK Bethel PA	7490na			
0300-0327	Czech Rep, Radio Prague	5930na	7345na			0300-0400	USA, WRNO New Orleans LA	9465am			
0300-0400	Ecuador, HCJB	9745am	21455am			0300-0400	USA, WSHB Cypress Crk SC	7395am			
0300-0330	Egypt, Radio Cairo	9475na				0300-0400	USA, WWCN Nashville TN	5850na			
0300-0350	Germany, Deutsche Welle	6085na	6145na	6185na	9535na	0300-0400	USA, WYER Okeechobee FL	3215am	5070am	5935am	7435am
		9640na				0300-0400	Vatican State, Vatican R	6065na	9505na		
0300-0400	Germany, Overcomer Ministr	5880na	7335na			0300-0400	Vatican State, Vatican R	6095am	7305ca		
0300-0400	Guatemala, Radio Cultural	3300do				0300-0400	Zambia, R Zambia/ZNBC 1	4910do			
0300-0400	Italy, IRRS	7120va				0300-0400	Zambia, R Zambia/ZNBC 2	6165do			
0300-0400	Japan, R Japan/NHK World	17685pa	17825ca	17855as		0300-0400	Zimbabwe, Zimbabwe BC	3396do			
0300-0400	Kenya, Kenya Broad Corp	4885do	4935do	6150do		0310-0340	Vatican State, Vatican R	7360af	9660af		
0300-0400	Lesotho, Radio Lesotho	4800do				0329-0359	Canada, R Canada Intl	6155na	9755na	9780na	
0300-0400	Malaysia, Radio	7295do				0330-0400	Albania, R Tirana Intl	6140na	7160na		
0300-0330	Mexico, Radio Mexico Intl	9705na				0330-0400	Czech Rep, Radio Prague	7350na	11600as		
0300-0325	Netherlands, Radio	9855as	11655as			0330-0400	Moldova, R Moldova Intl	7500na			
0300-0400	New Zealand, R NZ Intl	17675pa				0330-0400	Sweden, Radio	9475na	11665na		
0300-0310	Pakistan, Radio	7270va				0330-0400	Tanzania, Radio	5050af			
0300-0400	Papua New Guinea, NBC	9675do				0330-0400	UAE, Radio Dubai	12005na	13675na	15400na	21485na
0300-0400	Russia, Voice of Russia WS	5930na	6065na	6150na	7105na	0330-0400	UK, BBC African Service	3255af	6005af	6190af	9600af
		7125na	7175na	7260na	7345na	0330-0400	UK, BBC African Service	9610af	11730af		
0300-0400	Russia, Voice of Russia WS	5920na				0330-0400	UK, BBC Asian Service	9605as	11955as	15280as	15310as
0300-0330	S Africa, Channel Africa	5955af				0330-0400	UK, BBC World Service	5975am	6175na	6195eu	9410eu
0300-0400	Singapore, SBC Radio One	6160do				0330-0400	Vietnam, Voice of	9895am	11760me	12095af	9935na
0300-0400	Solomon Islands, SIBC	5020do				0340-0350	Greece, Voice of	6260na	7450na	9420na	9935na
0300-0400	Sri Lanka, Sri Lanka BC	9730as	15425as			0345-0400	Burundi, Radio Nationale	6140do			
0300-0400	Taiwan, Radio Taipei Intl	5950na	9680na	11745as	11825as	0345-0400	Tajikistan, Radio Dushanbe	4975as	9905as	11620as	
		15345as				0345-0400	Uganda, Radio	4976do			
0300-0330	Thailand, Radio	9655am	11905am	15460na		0345-0400	Zambia, Christian Voice	3330af	6065af		
0300-0400	Turkey, Voice of	7300na	9685me	17705as							
0300-0315	Uganda, Radio	4976do									

SELECTED PROGRAMS

Sundays

0300 UK, BBC London (af/am/as/eu): World News. See S 0100.
 0305 UK, BBC London (af/am/as/eu): Sports Roundup. See S 0145.
 0305 UK, BBC London (af/am/as/eu): World Business Review. A look back at the previous week's business and a preview of upcoming events.
 0330 UK, BBC London (af): African Quiz (1). A monthly test of the listener's knowledge of Africa.
 0330 UK, BBC London (af): Postmark Africa. Expert answers to any question under the sun.
 0330 UK, BBC London (am/eu): From Our Own Correspondent. BBC correspondents comment on the background to the news.
 0330 UK, BBC London (as): Global Business. NEW! Roger White presents this weekly series of interviews, features and discussions with the movers and shakers of the international business community.

Mondays

0300 UK, BBC London (af/am/as/eu): World News. See S 0100.
 0305 UK, BBC London (af/am/eu): Write On. See S 0030.
 0315 UK, BBC London (af/am/as/eu): Sports Roundup. See S 0145.
 0330 UK, BBC London (af): Network Africa. Breakfast show of news, sport, personalities, music, and listener's comments.
 0330 UK, BBC London (am/eu): The World Today (Eu). A new two-and-a-half hour breakfast news program (alternative programming for Europe).
 0330 UK, BBC London (am/eu): Westway. The World Service's first-ever regular drama (soap opera) serial.
 0330 UK, BBC London (as): Off the Shelf. Daily readings from the

best of world literature.

0345 UK, BBC London (as): Westway Access. See M 0030.

Tuesdays

0300 UK, BBC London (af/am/as/eu): World News. See S 0100.
 0305 UK, BBC London (af/am/eu): World Business Report. See M 0905.
 0315 UK, BBC London (af/am/as/eu): Sports Roundup. See S 0145.
 0330 UK, BBC London (af): Network Africa. See M 0330.
 0330 UK, BBC London (am/eu): Off the Shelf. See M 0330.
 0330 UK, BBC London (am/eu): Insight. See M 1645.
 0330 UK, BBC London (am/eu): The World Today (Eu). See M 0330.
 0345 UK, BBC London (as): Westway. See M 0330.

Wednesdays

0300 UK, BBC London (af/am/as/eu): World News. See S 0100.
 0305 UK, BBC London (af/am/eu): World Business Report. See M 0905.
 0315 UK, BBC London (af/am/as/eu): Sports Roundup. See S 0145.
 0330 UK, BBC London (af): Network Africa. See M 0330.
 0330 UK, BBC London (af/am/eu): Off the Shelf. See M 0330.
 0330 UK, BBC London (am/eu): Insight. See M 1645.
 0330 UK, BBC London (am/eu): The World Today (Eu). See M 0330.
 0345 UK, BBC London (as): Science Extra. See S 1501.

Thursdays

0300 UK, BBC London (af/am/as/eu): World News. See S 0100.
 0305 UK, BBC London (af/am/eu): World Business Report. See M 0905.

Fridays

0300 UK, BBC London (af/am/as/eu): World News. See S 0100.
 0305 UK, BBC London (af/am/eu): World Business Report. See M 0905.
 0315 UK, BBC London (af/am/as/eu): Sports Roundup. See S 0145.
 0330 UK, BBC London (af): Network Africa. See M 0330.
 0330 UK, BBC London (af/am/eu): Off the Shelf. See M 0330.
 0330 UK, BBC London (am/eu): Insight. See M 1645.
 0330 UK, BBC London (am/eu): The World Today (Eu). See M 0330.
 0345 UK, BBC London (as): The Learning Zone. See S 1515.
 0345 UK, BBC London (as): Waveguide (4). See S 1515.

Saturdays

0300 UK, BBC London (af/am/as/eu): World News. See S 0100.
 0305 UK, BBC London (af/am/eu): World Business Report. See M 0905.
 0315 UK, BBC London (af/am/as/eu): Sports Roundup. See S 0145.
 0330 UK, BBC London (af): Focus on Faith. See F 0230.
 0330 UK, BBC London (am/eu): Insight. See M 1645.
 0330 UK, BBC London (am/eu): Weekend (Eu). European magazine program co-produced by European broadcasters.
 0330 UK, BBC London (as): The Vintage Chart Show. See M 0730.
 0345 UK, BBC London (am/eu): Off the Shelf. See M 0330.

FREQUENCIES

0400-0500	Anguilla, Caribbean Beacon	6090am			0400-0430	Tanzania, Radio	5050af		
0400-0430 as	Armenia, Voice of	4810eu			0400-0430	Thailand, Radio	9655am	11905am	15460na
0400-0500	Australia, Radio	9660pa	12080pa	13605as	0400-0415	Uganda, Radio	4976do		
		15510pa	17795pa		0400-0430	UK, BBC African Service	3255af	6005af	6190af
0400-0500 as	Australia, Radio	17750as					9600af	9610af	11730af
0400-0500 vl	Australia, VL8K Katherine	5025do			0400-0430	UK, BBC World Service	3955eu	5975am	6175na
0400-0500 vl	Australia, VL8T Tent Crk	4910do					6195eu	9410eu	9895am
0400-0500	Australia, DefenseForces R	15635as					12095af	15575as	11760me
0400-0430 a	Belarus, R Belarus Intl	7105eu	7210eu		0400-0500	USA, KAIJ Dallas TX	5810am		
0400-0500	Canada, CBC N Quebec Svc	9625do			0400-0500	USA, KTBN Salt Lk City UT	7510am		
0400-0500	Canada, CFRX Toronto	6070do			0400-0500	USA, KVDO Los Angeles CA	9975am		
0400-0500	Canada, CFVP Calgary	6030do			0400-0500	USA, KWHR Naalehu HI	17510as	17780as	
0400-0500	Canada, CHNX Halifax	6130do			0400-0500	USA, Voice of America	6035af	6080af	7170af
0400-0500	Canada, CKZN St John's	6160do					7290af	7415af	9575af
0400-0500	Canada, CKZU Vancouver	6160do					9885af		9775af
0400-0429	Canada, R Canada Intl	6150me	9505me	9645me	0400-0500	USA, WEWN Birmingham AL	5825eu		
0400-0500	China, China Radio Intl	9560na	9730am		0400-0500	USA, WGTG McCaysville GA	5085am		
0400-0500	Costa Rica, RF Peace Intl	7385am	15050am		0400-0500	USA, WHRA Greenbush ME	9400me		
0400-0500	Cuba, Radio Havana	6000na	9820na	9830na	0400-0500	USA, WHRI Noblesville IN	5745am	7315am	
0400-0500	Ecuador, HCJB	9745na	21455am		0400-0500	USA, WINB Red Lion PA	11950am		
0400-0450	Germany, Deutsche Welle	5990af	6015af	7225af	0400-0500	USA, WJCR Upton KY	7490na		
		11765af			0400-0500	USA, WRMI/R Miami Intl	9955am		
0400-0500 twfha	Guatemala, Radio Cultural	3300do			0400-0500	USA, WRNO New Orleans LA	7395am		
0400-0500	Iraq, Radio Iraq Intl	11785eu			0400-0459 mw	USA, WSHB Cypress Crk SC	9840af		
0400-0415	Israel, Kol Israel	9435na	11605na	17535na	0400-0500	USA, WWCR Nashville TN	2390am	3215am	5070am
0400-0500 as/vl	Italy, IRRS	7120va			0400-0405 as	USA, WWCR Nashville TN	3210am		5935am
0400-0500 vl	Kenya, Kenya Broad Corp	4885do	4935do	6150do	0400-0500	USA, WYFR Okeechobee FL	6065na	9505na	9985eu
0400-0500 vl	Lesotho, Radio Lesotho	4800do			0400-0500	Zambia, Christian Voice	3330af	6065af	
0400-0500	Malaysia, Radio	7295do			0400-0500 vl	Zambia, R Zambia/ZNBC 1	4910do		
0400-0500 vl	Malaysia, RTM Kuching	7160do			0400-0500 vl	Zambia, R Zambia/ZNBC 2	6165do		
0400-0430 mtwhf	Mexico, Radio Mexico Intl	9705na			0400-0500	Zimbabwe, Zimbabwe BC	3396do		
0400-0458	New Zealand, R NZ Intl	17675pa			0415-0500 vl	Malawi, MBC	5993do		
0400-0430 m	Norway, Radio Norway Intl	7520na			0415-0500 s	USA, WRMI/R Miami Intl	9955am		
0400-0500 vl	Papua New Guinea, NBC	9675do			0425-0440 vl	Italy, RAI Intl	6010eu	7270na	
0400-0456	Romania, R Romania Intl	5990na	6155na	9690na	0425-0500	Nigeria, FRCN/Radio	3326do	4770do	4990do
		15335as		11740na	0430-0455	Belarus, R Belarus Intl	7105eu	7210eu	
0400-0500	Russia, Voice of Russia WS	5905na	5930na	6005na	0430-0500	Moldova, R Moldova Intl	7500na		
		6150na	7100na	7105na	0430-0500	Netherlands, Radio	6165na	9590na	
		7175na	7330na	7345na	0430-0500	UK, BBC African Service	3255af	6005af	6190af
		5920na			0430-0500	UK, BBC Asian Service	11955as	15280as	15310as
0400-0430	Russia, Voice of Russia WS	5955af			0430-0500	UK, BBC World Service	5875eu	5975am	6175am
0400-0500	S Africa, Channel Africa	6160do			0430-0500 s	UK, BBC World Service	12095af	15575as	11760me
0400-0500 vl	Singapore, SBC Radio One	5020do			0455-0500	Malaysia, Voice of	3955eu	6180eu	6195eu
0400-0430	Solomon Islands, SIBC	9730as	15425as	6100af	0455-0500	Nigeria, Voice of	6175as	9750as	9410eu
0400-0500	Sri Lanka, Sri Lanka BC	3200af	4775af		0455-0500	New Zealand, R NZ Intl	7255af	15120af	15295au
0400-0500	Swaziland, Trans World R	9885na	9905na		0459-0500		11905pa		
0400-0430	Switzerland, Swiss R Intl	5840eu	6165eu						
0400-0415	Tajikistan, Radio Dushanbe	7245as							

SELECTED PROGRAMS

Sundays

0400 Switzerland, Swiss R Intl: News. Five minutes of world news.
 0400 UK, BBC London (af/am/eu): Newsdesk. See S 0000.
 0405 Switzerland, Swiss R Intl: Newsnet. Analyses of the main international stories by Swiss-based specialists.
 0415 Switzerland, Swiss R Intl: Capital Letters (2/4). SRI's bimonthly mailbag and listener contact program.
 0415 Switzerland, Swiss R Intl: Sounds Good (3/5). Music from Switzerland and the people who make it.
 0415 Switzerland, Swiss R Intl: The Name Game (1). A chance for you to test your knowledge of Switzerland and win prizes.
 0430 Switzerland, Swiss R Intl: Rendez-vous with Switzerland. A relaxing blend of music and interviews.
 0430 UK, BBC London (af): Art Beat. A new arts program for Africa.
 0430 UK, BBC London (am/eu): Global Business. See S 0330.
 0430 UK, BBC London (as): From Our Own Correspondent. See S 0330.

Mondays

0400 Switzerland, Swiss R Intl: News. See S 0400.
 0400 UK, BBC London (af/am/eu): The World Today. Examines thoroughly a topical aspect of the international scene.
 0405 Switzerland, Swiss R Intl: Newsnet. See S 0405.
 0430 Switzerland, Swiss R Intl: Rendez-vous with Switzerland. See S 0430.
 0430 UK, BBC London (af): Network Africa. See M 0330.
 0430 UK, BBC London (am/eu): Variable Feature. See S 0130.
 0430 UK, BBC London (as): Blues World. See S 1130.
 0430 UK, BBC London (eu): The World Today. See M 0330.

Tuesdays

0400 Switzerland, Swiss R Intl: News. See S 0400.
 0400 UK, BBC London (af/am/eu): The World Today. See M 0400.
 0405 Switzerland, Swiss R Intl: Newsnet. See S 0405.
 0430 Switzerland, Swiss R Intl: Rendez-vous with Switzerland. See S 0430.
 0430 UK, BBC London (af): Network Africa. See M 0330.
 0430 UK, BBC London (am/eu): Outlook. See M 1405.
 0430 UK, BBC London (am/eu): The World Today (Eu). See M 0330.
 0430 UK, BBC London (as): Multitrack Hit-List. See M 1615.
 0455 UK, BBC London (am/eu): Take Five. A short series of human interest stories.

Wednesdays

0400 Switzerland, Swiss R Intl: News. See S 0400.
 0400 UK, BBC London (af/am/eu): The World Today. See M 0400.
 0405 Switzerland, Swiss R Intl: Newsnet. See S 0405.
 0430 Switzerland, Swiss R Intl: Rendez-vous with Switzerland. See S 0430.
 0430 UK, BBC London (af): Network Africa. See M 0330.
 0430 UK, BBC London (am/eu): Outlook. See M 1405.
 0430 UK, BBC London (as): Megamix. See T 1615.
 0455 UK, BBC London (am/eu): Take Five. See T 0455.

Thursdays

0400 Switzerland, Swiss R Intl: News. See S 0400.
 0400 UK, BBC London (af/am/eu): The World Today. See M 0400.
 0405 Switzerland, Swiss R Intl: Newsnet. See S 0405.
 0430 Switzerland, Swiss R Intl: Rendez-vous with Switzerland. See S 0430.

Fridays

0400 Switzerland, Swiss R Intl: News. See S 0400.
 0400 UK, BBC London (af/am/eu): The World Today. See M 0400.
 0405 Switzerland, Swiss R Intl: Newsnet. See S 0405.
 0430 Switzerland, Swiss R Intl: Rendez-vous with Switzerland. See S 0430.
 0430 UK, BBC London (af): Network Africa. See M 0330.
 0430 UK, BBC London (am/eu): Outlook. See M 1405.
 0430 UK, BBC London (as): John Peel. See M 1130.
 0430 UK, BBC London (eu): The World Today. See M 0330.
 0455 UK, BBC London (am/eu): Science View. See S 0040.

Saturdays

0400 Switzerland, Swiss R Intl: News. See S 0400.
 0400 UK, BBC London (af/am/eu): Newsdesk. See S 0000.
 0405 Switzerland, Swiss R Intl: Newsnet. See S 0405.
 0430 Switzerland, Swiss R Intl: Rendez-vous with Switzerland. See S 0430.
 0430 UK, BBC London (af): African News. See S 1740.
 0430 UK, BBC London (am/eu): Outlook. See M 1405.
 0430 UK, BBC London (as): Multitrack Alternative. See F 1430.
 0431 UK, BBC London (af): African Quiz (1). See S 0330.
 0431 UK, BBC London (af): This Week and Africa. A roundup of the week's political developments across the continent.
 0455 UK, BBC London (am/eu): Spotlight. See F 1555.

FREQUENCIES

0500-0600	Anguilla, Caribbean Beacon	6090am				0500-0530	S Africa, Channel Africa	9675af	
0500-0600	Australia, Radio	9660pa	12080pa	13605as	15240pa	0500-0600	Singapore, SBC Radio One	6160do	
		15510as	17795pa			0500-0600	Solomon Islands, SIBC	5020do	
0500-0600 as	Australia, Radio	17750as				0500-0600	Spain, R Exterior Espana	6055am	
0500-0600 vl	Australia, VL8K Katherine	5025do				0500-0600	Swaziland, Trans World R	4775af	6100af
0500-0600 vl	Australia, VL8T Tent Crk	4910do				0500-0515	Uganda, Radio	4976do	
0500-0600	Australia, DefenseForces R	15635as				0500-0600	UK, BBC African Service	3255af	6005af
0500-0600 vl	Cameroon, Radio Cameroon	4850do				0500-0530	UK, BBC Asian Service	9600af	15420af
0500-0600	Canada, CBC N Quebec Svc	9625do				0500-0600	USA, KAIJ Dallas TX	5810am	
0500-0600	Canada, CFRX Toronto	6070do				0500-0600	USA, KTBN Salt Lk City UT	7510am	
0500-0600	Canada, CFVP Calgary	6030do				0500-0600	USA, KWHR Naalehu HI	17555pa	17780as
0500-0600	Canada, CHNX Halifax	6130do				0500-0600	USA, Voice of America	5970af	6035af
0500-0600	Canada, CKZU Vancouver	6160do				0500-0600	USA, WHRA Greenbush ME	11956eu	12080af
0500-0600	China, China Radio Intl	9560na				0500-0600	USA, WHRI Noblesville IN	5745am	7315am
0500-0600	Costa Rica, Adv World R	5030ca	6150ca	9725ca		0500-0600	USA, WINB Red Lion PA	11950am	
0500-0600 as	Costa Rica, Adv World R	7375am				0500-0600	USA, WJCR Upton KY	7490na	
0500-0600	Costa Rica, RF Peace Intl	7385am	15050am			0500-0530	USA, WRMI/R Miami Intl	9955am	
0500-0600	Cuba, Radio Havana	6180na	9820na	9830na		0500-0600	USA, WRNO New Orleans LA	7395am	
0500-0600	Ecuador, HCJB	9745na	21455am			0500-0600	USA, WSHB Cypress Crk SC	7535eu	
0500-0550	Germany, Deutsche Welle	6045na	6185na	9615am	11810na	0500-0559	USA, WSHB Cypress Crk SC	9835af	
0500-0600	Guyana, GBC/Voice of	5950do				0500-0559	USA, WWCR Nashville TN	2390am	3210am
0500-0600 vl	Italy, IRRS	3985va				0500-0600	USA, WYFR Okeechobee FL	5985na	5995af
0500-0600	Japan, R Japan/NHK World	6110na	7230eu	9835na	11715as	0500-0600	Vatican State, Vatican R	4005eu	5883eu
		11760as	11840as	11850pa	15230pa	0500-0530	Vatican State, Vatican R	7360af	9660af
		17810as				0500-0600	Zambia, Christian Voice	3330af	6065af
0500-0600 vl	Kenya, Kenya Broadc Corp	4885do	4935do	6150do		0500-0530	Zambia, R Zambia/ZNBC 1	4910do	
0500-0600 vl	Kiribati, Radio	9810do				0500-0600	Zambia, R Zambia/ZNBC 2	6165do	
0500-0510 vl	Lesotho, Radio Lesotho	4800do				0500-0600	Zimbabwe, Zimbabwe BC	3396do	
0500-0600	Liberia, Radio Veritas	3450do				0500-0600	Swaziland, Trans World R	9500af	
0500-0600	Liberia, Star Radio	3400do				0525-0600	Ghana, Ghana Broadc Corp	3366do	4915do
0500-0600	Liberia, LCN/R Liberia Int	5100do				0530-0600	Austria, R Austria Intl	6015na	6155eu
0500-0510 mtwhf	Malawi, MBC	3380do				0530-0600	17870me	13730eu	15410me
0500-0600	Malaysia, Radio	7295do				0530-0600	Switzerland, Swiss R Intl	5840eu	6165eu
0500-0600 vl	Malaysia, RTM Kuching	4895do	7160do			0530-0600	Thailand, Radio	9655eu	11905eu
0500-0600	Malaysia, Voice of	6175as	9750as	15295au		0530-0530	UAE, Radio Dubai	15435as	17830as
0500-0525	Netherlands, Radio	6165na	9590na			0530-0600	UK, BBC Asian Service	9740as	11955pa
0500-0600	New Zealand, R NZ Intl	11905pa				0530-0600	UK, BBC World Service	17760as	21660as
0500-0505	Nigeria, FRCN/Radio	3326do	4770do	4990do		0530-0600	UK, BBC World Service	3990eu	5975am
0500-0600	Nigeria, Voice of	7255af	15120af			0530-0600	6050eu	6050eu	6175am
0500-0600	North Korea, R Pyongyang	11740eu	13790eu			0530-0600	7150eu	7270eu	11760ma
0500-0504	Pakistan, Radio	7270va				0530-0600	17640af		
0500-0600 vl	Papua New Guinea, NBC	9675do							
0500-0600	Russia, Voice of Russia WS	5905na	5920na	5930na	6005na				
		6065na	6150na	7175na	7330na				
		9580na	12025as	12055na	15460na				
		15470au	17495as	17570au	17795as				
		21790au							

SELECTED PROGRAMS

Sundays

0500 Ecuador, HCJB Quito (am): Musical Mailbag. HCJB staffers have a good time reading listener letters and playing music.
 0500 UK, BBC London (af/am/as/eu): Newsday. See S 0200.
 0530 Ecuador, HCJB Quito (am): Afterglow. Don Johnson plays religious music.
 0530 UK, BBC London (af): Postmark Africa. See S 0330.
 0530 UK, BBC London (am/eu): In Praise of God. See S 0230.
 0530 UK, BBC London (am/eu): Play of the Week (Am). A different radio drama program each week (alternative programming for the America).
 0530 UK, BBC London (as): Westway Compilation Edition. Catch up on the week's episodes of the World Service's drama serial.

Mondays

0500 Ecuador, HCJB Quito (am): Radio Reading Room. Readings from new Christian books.
 0500 UK, BBC London (af/am/as/eu): The World Today. See M 0400.
 0530 Ecuador, HCJB Quito (am): The Sower. Michael Guido presents music and inspiration.
 0530 UK, BBC London (af): Network Africa. See M 0330.
 0530 UK, BBC London (am/eu): The Works. See M 0230.
 0530 UK, BBC London (as): Pick of the World. See M 0130.
 0530 UK, BBC London (as): Variable Feature. See S 0130.
 0530 UK, BBC London (eu): Europe Today. All the latest news, analysis and comment.
 0545 Ecuador, HCJB Quito (am): Science, Scripture and Salvation. Proving scientific principles with the Bible.

Tuesdays

0500 Ecuador, HCJB Quito (am): The Least of These. Ken MacHarg focuses on human needs around the world.
 0500 UK, BBC London (af/am/as/eu): The World Today. See M 0400.
 0530 Ecuador, HCJB Quito (am): Let My People Think. Addressing questions of today's thinking Christians.
 0530 UK, BBC London (af): Network Africa. See M 0330.
 0530 UK, BBC London (am/eu): Discovery. See T 0230.
 0530 UK, BBC London (as): Omnibus. See S 1715.
 0530 UK, BBC London (eu): The World Today. See M 0330.

Wednesdays

0500 Ecuador, HCJB Quito (am): Vital Signs. Join Karen Schmidt for a journey through the world of
 0500 UK, BBC London (af/am/as/eu): The World Today. See M 0400.
 0515 Ecuador, HCJB Quito (am): The Book and the Spade. The quest for biblical knowledge through archaeology.
 0530 Ecuador, HCJB Quito (am): Unshackled. Pacific Garden Mission's radio drama.
 0530 UK, BBC London (af): Network Africa. See M 0330.
 0530 UK, BBC London (am/eu): One Planet. See T 1830.
 0530 UK, BBC London (as): World of Football. Behind the scenes in the World Cup competition.
 0530 UK, BBC London (eu): The World Today. See M 0330.

Thursdays

0500 Ecuador, HCJB Quito (am): Rock Solid!. A new one-hour program of contemporary (rock) Christian music.

0500 UK, BBC London (af/am/as/eu): The World Today. See M 0400.
 0530 UK, BBC London (af): Network Africa. See M 0330.
 0530 UK, BBC London (am/eu): Variable Feature. See S 0130.
 0530 UK, BBC London (eu): The World Today. See M 0330.
 0545 UK, BBC London (am/eu): The Learning World. News and views about worldwide education.
 0545 UK, BBC London (am/eu): Waveguide (4). See S 1515.

Fridays

0500 UK, BBC London (af/am/as/eu): The World Today. See M 0400.
 0530 Ecuador, HCJB Quito (am): Inspirational Classics. Scott and Judy Gillen of New Zealand with a program of sacred classical music. (<http://iconz.co.nz/~gillen/c.html>)
 0530 UK, BBC London (af): Network Africa. See M 0330.
 0530 UK, BBC London (am/eu): Assignment. See H 0230.
 0530 UK, BBC London (as): Focus on Faith. See F 0230.
 0530 UK, BBC London (eu): The World Today. See M 0330.

Saturdays

0500 Ecuador, HCJB Quito (am): Inside HCJB. Paul Bell gives you a inside look at the Voice of the Andes.
 0500 UK, BBC London (af/am/as/eu): Newsday. See S 0200.
 0530 Ecuador, HCJB Quito (am): Walkin' in the Sunshine. Ben Cummings serves as your host for this.
 0530 UK, BBC London (af): African News. See S 1740.
 0530 UK, BBC London (am/eu): Science in Action. See M 0930.
 0530 UK, BBC London (as): Variable Feature. See S 0130.
 0531 UK, BBC London (af): Talkabout Africa. See W 1615.

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FREQUENCIES

SELECTED PROGRAMS

Sundays

0600 UK, BBC London (at/am/as/eu): World News. See S 0100.
 0615 UK, BBC London (at): Variable Feature. See S 0130.
 0615 UK, BBC London (am/as/eu): Letter from America. See S 0030.
 0630 Switzerland, Swiss R Intl: News. See S 0400.
 0630 UK, BBC London (at): African Perspective. A considered view of life and issues facing the African continent.
 0630 UK, BBC London (am/eu): A Jolly Good Show. Dave Lee Travis presents your record requests and dedications in his own unique way.
 0630 UK, BBC London (am/eu): Play of the Week (Am). See S 0530.
 0630 UK, BBC London (as): Meridian. A topical program about the world of the arts featuring books, a live report about theater, or a special event.
 0635 Switzerland, Swiss R Intl: Newsnet. See S 0405.

Mondays

0600 UK, BBC London (af/as): World News. See S 0100.
0600 UK, BBC London (am/eu): Newsday. See S 0200.
0615 UK, BBC London (af): Sports Roundup. See S 0145.
0615 UK, BBC London (as): Seven Days. Roundup of the week's news, plus sports highlights, finance and the weather.
0630 Switzerland, Swiss R Int'l: News. See S 0400.
0630 UK, BBC London (af): Network Africa. See M 0330.
0630 UK, BBC London (am/eu): Omnibus. See S 1715.
0630 UK, BBC London (am/eu): Variable Feature. See S 0130.
0630 UK, BBC London (as): Jazzmatazz. See S 0730.
0635 Switzerland, Swiss R Int'l: Newsnet. See S 0405.

Tuesdays

0600 UK, BBC London (af/am/as/eu): World News. See S 0100.
0615 UK, BBC London (af): Sports Roundup. See S 0145.
0615 UK, BBC London (am/as/eu): Insight. See M 1645.
0630 Switzerland, Swiss R I Int'l News. See S 0400.

0630 UK, BBC London (af): Network Africa. See M 0330.
0630 UK, BBC London (am/eu): Variable Feature. See S 0130.
0630 UK, BBC London (as): Composer of the Month. See M 1930.
0635 Switzerland Swiss R Int'l Newsnet. See S 0405

Wednesdays

- 0600 UK, BBC London (af/am/as/eu): World News. See S 0100.
- 0615 UK, BBC London (af): Sports Roundup. See S 0145.
- 0615 UK, BBC London (am/as/eu): Insight. See M 1645.
- 0630 Switzerland, Swiss R Int'l: News. See S 0400.
- 0630 UK, BBC London (af): Network Africa. See M 0330.
- 0630 UK, BBC London (am/eu): World of Football. See W 0530.
- 0630 UK, BBC London (as): Meridian On Screen. See M 1930.
- 0635 Switzerland, Swiss R Int'l: Newsnet. See S 0405.

Thursdays

0600 UK, BBC London (af/am/as/eu): World News. See S 0100.
 0615 UK, BBC London (af): Sports Roundup. See S 0145.
 0615 UK, BBC London (am/as/eu): Insight. See M 1645.
 0630 Switzerland, Swiss R Int'l: News. See S 0400.
 0630 UK, BBC London (af): Network Africa. See M 0330.
 0630 UK, BBC London (am/as/eu): Meridian. See S 0630.
 0635 Switzerland, Swiss R Int'l: Newsnet. See S 0405.

Fridays

0600 UK, BBC London (af/am/as/eu): World News. See S 0100.
 0615 UK, BBC London (af): Sports Roundup. See S 0145.
 0615 UK, BBC London (am/as/eu): Insight. See M 1645.
 0630 Switzerland, Swiss R Intl: News. See S 0400.
 0630 UK, BBC London (af): Network Africa. See M 0330.
 0630 UK, BBC London (am): Pick of the World. See M 0130.
 0630 UK, BBC London (am/eu): Variable Feature. See S 0130.
 0630 UK, BBC London (as): Music Review. See S 0230.
 0635 Switzerland, Swiss R Intl: Newsnet. See S 0405.

Saturdays

0600 UK, BBC London (af/am/as/eu): World News. See S 0100.
0615 UK, BBC London (af): Letter from America. See S 0030.
0615 UK, BBC London (am/eu): The New Europe. A new program that looks at issues affect European countries in transition to the European union.
0615 UK, BBC London (as): Insight. See M 1645.
0630 Switzerland, Swiss R Int'l: News. See S 0400.
0630 UK, BBC London (af): African News. See S 1740.
0630 UK, BBC London (am/as/eu): Meridian. See S 0630.
0631 UK, BBC London (af): African Quiz (1). See S 0330.
0631 UK, BBC London (af): This Week and Africa. See A 0431.
0635 Switzerland, Swiss R Int'l: Newsnet. See S 0405.

HAUSER'S HIGHLIGHTS

798 registrations for Zagreb, 100 kW:

Z98 registrations for Zagreb, 100 kW:
kHz UTC

<u>KHz</u>	<u>UTC</u>
5900	1600-1900
6025	0600-1200
6145	0400-0600
7125	1200-1800
7185	0800-1200

9830 0500-1600

0700 UTC

3:00 AM EDT/12:00 PM PDT

SHORTWAVE GUIDE

0800 UTC

4:00 AM EDT/1:00 AM PDT

FREQUENCIES

0700-0800	Anguilla, Caribbean Beacon	6090am				0800-0900	Albania, TWR Tirana	9685eu	
0700-0800	Australia, Radio	9660pa	11880pa	12080pa	13605pa	0800-0900	Anguilla, Caribbean Beacon	6090am	
		15240pa	15415as	15510as	17750as	0800-0830	Australia, Radio	5995pa	
0700-0800 vl	Australia, VL8K Katherine	5025do				0800-0830 vl	Australia, VL8K Katherine	5025do	
0700-0800 vl	Australia, VL8T Tent Crk	4910do				0800-0830 vl	Australia, VL8T Tent Crk	4910do	
0700-0800	Canada, CFRX Toronto	6070do				0800-0900 vl	Canada, CBC N Quebec Svc	9625do	
0700-0800	Canada, CFVP Calgary	6030do				0800-0900	Canada, CFRX Toronto	6070do	
0700-0800	Canada, CHNX Halifax	6130do				0800-0900	Canada, CFVP Calgary	6030do	
0700-0800	Canada, CKZU Vancouver	6160do				0800-0900	Canada, CHNX Halifax	6130do	
0700-0800	Costa Rica, RF Peace Intl	7385am	15050am			0800-0900	Canada, CKZU Vancouver	6160do	
0700-0800	Ecuador, HCJB	5865eu	9640pa	21455am		0800-0900	Costa Rica, RF Peace Intl	6980am	
0700-0800 as	Eqt Guinea, R East Africa	15186af				0800-0857	Czech Rep. Radio Prague	9505eu	
0700-0800 mtwhf	Eqt Guinea, Radio Africa	15186af				0800-0900	Ecuador, HCJB	5865eu	
0700-0800	Germany, Overcomer Ministr	9500au				0800-0900 as	Eqt Guinea, R East Africa	15186af	
0700-0715	Ghara, Ghana Broadc Corp	3366do	4915do			0800-0900	Eqt Guinea, Radio Africa	15186af	
0700-0800	Guyana, GBC/Voice of	5950do				0800-0805 s	Ghana, Ghana Broadc Corp	3366do	
0700-0730 vl	Italy, IRRS	3985va				0800-0900	Guam, TWR/KTWR	15200as	
0700-0800 vl	Kenya, Kenya Broadc Corp	4885do	4935do	6150do		0800-0900	Guyana, GBC/Voice of	5950do	
0700-0800 vl	Kiribati, Radio	9810do				0800-0900	Indonesia, Voice of	11785as	
0700-0800	Libera, Radio Veritas	5470do				0800-0900 fas/vl	Italy, IRRS	7120va	
0700-0800	Libera, Star Radio	3400do				0800-0900 vl	Kiribati, Radio	9810do	
0700-0715	Libera, LCN/R Liberia Int	5100do				0800-0900	Liberia, Radio Veritas	5470do	
0700-0800	Malaysia, Radio	7295do				0800-0900	Liberia, LCN/R Liberia Int	5100do	
0700-0800	Malaysia, Voice of	6175as	9750as	15295au		0800-0900	Malaysia, Radio	7295do	
0700-0730 mtwhf	Malta, VO Mediterranean	9660eu				0800-0830	Malaysia, Voice of	6175as	
0700-0800 s	Malta, VO Mediterranean	9660eu				0800-0900 s	Malta, VO Mediterranean	9660eu	
0700-0800	Monaco, Trans World Radio	9755eu				0800-0835 a	Monaco, Trans World Radio	9755eu	
0700-0716 mtwhf	New Zealand, R NZ Intl	11905pa				0800-0850 s	Monaco, Trans World Radio	9755eu	
0700-0758 as	New Zealand, R NZ Intl	11905pa				0800-0820 mtwhf	Monaco, Trans World Radio	9755eu	
0700-0730 s	Norway, Radio Norway Intl	9590va	11625va			0800-0900	Netherlands, Radio	9720pa	
0700-0800 vl	Papua New Guinea, NBC	9675do				0800-0900	New Zealand, R NZ Intl	9795pa	
0700-0756	Romania, R Romania Intl	11775af	15365af	17775af		0800-0900 as	Norway, Radio Norway Intl	11625au	
0700-0800	Russia, Voice of Russia WS	9875as	12025as	12055as	15460as	0800-0830 s	Pakistan, Radio	15530eu	
		17495as	17795as	17860as		0800-0805	Palau, KHBN/Voice of Hope	17555eu	
0700-0710	Sierra Leone, SLBS	3316do				0800-0900	Papua New Guinea, NBC	9985as	
0700-0800	Singapore, SBC Radio One	6160do				0800-0900	Russia, Voice of Russia WS	9675do	
0700-0800 vl	Solomon Islands, SIBC	5020do				0800-0900	9825au	9835au	17495as
0700-0800	South Korea, R Korea Intl	9570au	13670eu			0800-0900	17860as	9875as	
0700-0735	Swaziland, Trans World R	6100af	9500af	9650af		0800-0900 f	Seychelles, FEBA Radio	15540as	
0700-0800	Taiwan, Radio Taipei Intl	5950na	6190af	9600af	11940af	0800-0810	Sierra Leone, SLBS	3316do	
0700-0715	UK, BBC African Service	17830af				0800-0900	Singapore, SBC Radio One	6160do	
0700-0800 as	UK, BBC African Service	17885af				0800-0900	Solomon Islands, SIBC	5020do	
0700-0800	UK, BBC Asian Service	7145pa	9740as	11955pa	15310as	0800-0805 as	Swaziland, Trans World R	6100af	
		15360as	17760as	17790as	21660as	0800-0900 as	UK, BBC African Service	9785af	
0700-0730	UK, BBC World Service	5975am	6175am	6180eu	6195eu	0800-0810	UK, BBC Asian Service	7145pa	
		7325eu	9410eu	11760me	12095eu	0800-0900	UK, BBC World Service	11750as	
0700-0800	USA, KAIJ Dallas TX	5810am				0800-0900	UK, BBC World Service	11955pa	
0700-0800	USA, KTBN Salt Lk City UT	7510am				0800-0900 as	USA, KAIJ Dallas TX	5810am	
0700-0800	USA, KWHR Naalehu HI	17555pa	17780as			0800-0900	USA, KHBI N Mariana Is	15665eu	
0700-0800	USA, WEWN Birmingham AL	5825eu				0800-0859 s	USA, KNLS Anchor Point AK	9615as	
0700-0800	USA, WHRA Greenbush ME	11565af				0800-0900	USA, KTBN Salt Lk City UT	7510am	
0700-0800	USA, WHRI Noblesville IN	5745am	7315am			0800-0900	USA, KWHR Naalehu HI	11565pa	
0700-0800	USA, WJCR Upton KY	7490na				0800-0900	USA, WEWN Birmingham AL	17780as	
0700-0800	USA, WWCR Nashville TN	2390am	3210am	5070am	5935am	0800-0900	USA, WHRI Noblesville IN	5745am	
0700-0800	USA, WYFR Okeechobee FL	7355eu	9355af	9985af		0800-0900	USA, WJCR Upton KY	7490na	
0700-0800 vl	Vanuatu, Radio	3945do	4960do			0800-0900	USA, WMLK Bethel PA	9465am	
0700-0800	Zambia, Christian Voice	6065af				0800-0859 sa	USA, WSHB Cypress Crk SC	7535eu	
0700-0800 vl	Zambia, R Zambia/ZNBC 1	7220do				0800-0859 smtwh	USA, WSHB Cypress Crk SC	9845pa	
0700-0800 vl	Zambia, R Zambia/ZNBC 2	6165do				0800-0900	USA, WWCR Nashville TN	2390am	
0700-0800 vl	Zimbabwe, Zimbabwe BC	5975do				0800-0900	USA, WYFR Okeechobee FL	7315am	
0703-0710 as	Croatia, Croatian Radio	6025eu	9830eu			0800-0900	Zambia, Christian Voice	6065af	
0715-0730 s	Greece, Voice of	11645eu	7430eu	7450eu	9425au	0800-0900	Zambia, R Zambia/ZNBC 1	7220do	
0715-0730	UK, BBC African Service	6005af	6190af	9600af	11940af	0800-0900	Zimbabwe, Zimbabwe BC	5975do	
0715-0730	UK, BBC World Service	9635eu	11680eu	11845eu	13745eu	0800-0900	Croatia, Croatian Radio	6165do	
0717-0800 mtwhf	New Zealand, R NZ Intl	9795pa				0803-0810 mtwhf	UK, BBC Asian Service	9740as	
0730-0755	Belgium, R Vlaanderen Int	7290eu	9940au			0810-0900	9740as	11750as	15310as
0730-0740 s	Greece, Voice of	15325eu	7430eu	7450eu	9425au	0815-0900 mtwhf	Nigeria, FRCN/Radio	15360as	
		11645eu	9425au	9775au		0830-0900	Australia, Radio	6080as	9580pa
0730-0800 fas/vl	Italy, IRRS	7120va				0830-0900	Australia, VL8A Alice Spg	15415as	9710pa
0730-0800	Netherlands, Radio	9730pa	9820pa			0830-0900	Australia, VL8K Katherine	2310do	
0730-0800	Switzerland, Swiss R Intl	9885af	11860af	13635af		0830-0900	Australia, VL8T Tent Crk	2485do	
0730-0800	UK, BBC African Service	6190af	9600af	11940af	15400af	0830-0900	Austria, R Austria Intl	2325do	
0730-0800		17830af				0830-0900	Georgia, Georgian Radio	6155eu	
0730-0800	UK, BBC World Service	5975am	6175am	7325eu	9410eu	0830-0900	Italy, AWR Europe	13730eu	17870me
		11760me	12095eu	15485eu	15565eu	0830-0900	Lithuania, Radio Vilnius	9710eu	
0730-0800		17640eu				0830-0900	Slovakia, R Slovakia Intl	11990as	17485au
0730-0800 as	UK, BBC World Service	15575as				0830-0900	South Korea, R Korea Intl	9570as	21705au
0730-0745	UK, BBC World Service	5875eu	7260eu			0830-0900	Switzerland, Swiss R Intl	13670eu	
0735-0800 as	Swaziland, Trans World R	6100af	9500af	9650af		0830-0900	UK, BBC African Service	9885au	13685au
0740-0800	Guam, TWR/KTWR	15200as				0830-0900	Guam, TWR/KTWR	6190af	15400af
0745-0800	Albania, TWR Tirana	9685eu				0855-0900		15330pa	17830af
0745-0800 s	Ghana, Ghana Broadc Corp	3366do							
0759-0800 as	New Zealand, R NZ Intl	9795pa							

0900 UTC

5:00 AM EDT/2:00 AM PDT

SHORTWAVE GUIDE

1000 UTC

6:00 AM EDT/3:00 AM PDT

MT

FREQUENCIES

0900-0920 as	Albania, TWR Tirana	9685eu			1000-1100	Anguilla, Caribbean Beacon	6090am			
0900-1000	Anguilla, Caribbean Beacon	6090am			1000-1100	Australia, Radio	6080as	9580pa	11880as	
0900-1000	Australia, Radio	6080as	9580pa	9770as	11880as	Australia, VL8A Alice Spg	2310do		17750as	
		17750as			1000-1100	Australia, VL8K Katherine	2485do			
0900-1000 vl	Australia, VL8A Alice Spg	2310do			1000-1100	Australia, VL8T Tent Crk	2325do			
0900-1000 vl	Australia, VL8K Katherine	2485do			1000-1100	Canada, CBC N Quebec Svc	9625do			
0900-1000 vl	Australia, VL8T Tent Crk	2325do			1000-1100	Canada, CFRX Toronto	6070do			
0900-1000	Canada, CFRX Toronto	6070do			1000-1100	Canada, CFVP Calgary	6030do			
0900-1000	Canada, CFVP Calgary	6030do			1000-1100	Canada, CHNX Halifax	6130do			
0900-1000	Canada, CHNX Halifax	6130do			1000-1100	Canada, CKZN St John's	6160do			
0900-1000	Canada, CKZU Vancouver	6160do			1000-1100	Canada, CKZU Vancouver	6160do			
0900-1000	China, China Radio Intl	9785pa	11755pa		1000-1100	China, China Radio Intl	9785pa	11755pa		
0900-1000	Costa Rica, RF Peace Intl	6980am	15050am		1000-1100	Costa Rica, RF Peace Intl	6980am	15050am		
0900-1000	Ecuador, HCJB	9640pa	21455am		1000-1100	Czech Rep., Radio Prague	17485af	21705me		
0900-1000 as	Eqt Guinea, R East Africa	15186af			1000-1100	Ecuador, HCJB	9640pa	21455am		
0900-1000 mtwhf	Eqt Guinea, Radio Africa	15186af			1000-1100 as	Eqt Guinea, R East Africa	15186af			
0900-0950	Germany, Deutsche Welle	6160pa	9565af	12055as	15205af	Eqt Guinea, Radio Africa	15186af			
		15410af	17715as	17800af	21600af	1000-1100	Guam, AWR/KSDA	7455as		
		21680as			1000-1100	Guam, TWR/KTWR	9865as			
					1000-1100	India, All India Radio	11585au	11735au	13700au	
						1000-1100	17840as	15050au		
0900-0915 mtwhf	Ghana, Ghana Broadc Corp	3366do	4915do		1000-1100 fas/vl	Italy, IRRS	7120va			
0900-1000	Guam, TWR/KTWR	15330as			1000-1100	Japan, R Japan/NHK World	9695as	11730as	11850pa	
0900-0915	Guam, TWR/KTWR	15200as			1000-1100	Jordan, Radio	11690eu			
0900-1000	Guyana, GBC/Voice of	5950do			1000-1100	Liberia, Radio Veritas	5470do			
0900-1000 fas/vl	Italy, IRRS	7120va			1000-1100	Malaysia, Radio	7295do			
0900-0930 vl	Kiribati, Radio	9810do			1000-1100 irreg	Malaysia, RTM KotaKinabalu	5980do			
0900-1000	Liberia, Radio Veritas	5470do			1000-1100 s	Malta, VO Mediterranean	9660eu			
0900-0915	Liberia, LCN/R Liberia Int	5100do			1000-1100	Netherlands, Radio	12065as	13710as		
0900-1000	Malaysia, Radio	7295do			1000-1100	New Zealand, R NZ Intl	9795pa			
0900-1000 vl	Malaysia, RTM Kuching	4895do	7160do		1000-1100	Nigeria, Voice of	7255af	15120af		
0900-0925	Netherlands, Radio	9720pa	9820pa		1000-1100 vl	Papua New Guinea, NBC	4890do			
0900-1000	New Zealand, R NZ Intl	9795pa			1000-1100	Philippines, FBC/R Intl	11635as			
0900-1000 vl	Papua New Guinea, NBC	4890do			1000-1100	Singapore, SBC Radio One	6160do			
0900-1000	Singapore, SBC Radio One	6160do			1000-1100	Solomon Islands, SIBC	5020do			
0900-1000 vl	Solomon Islands, SIBC	5020do			1000-1100	Switzerland, Swiss R Intl	6165eu	9535eu		
0900-1000	UK, BBC African Service	6190af	11940af	15400af	1000-1100 as	UK, BBC African Service	6190af	11940af	17885af	
		17885af			1000-1100	UK, BBC Asian Service	15400af	17830af		
0900-0915	UK, BBC Asian Service	6065as	6195as	7235as	9580as	1000-1100	UK, BBC Asian Service	6195as	9740as	
		9740as	11750as	11765as	11955as	1000-1100	15310as	11750as	11765as	
		15280as	15310as	15360as	17760as	1000-1100 as	USA, BBC World Service	9410eu	15360as	
		17790as	21660as			1000-1100	USA, KAI Dallas TX	11760me	17790as	
0900-1000	UK, BBC World Service	9410eu	11760me	12095eu	15575as	1000-1100	USA, KAI Dallas TX	15565eu	21660as	
		15485eu	15565eu	15575as	17640eu	1000-1100	USA, KHBI N Mariana Is	15665as	17705af	
		17705af				1000-1100	USA, KTBN Salt Lk City UT	7510am		
0900-1000	USA, KAIJ Dallas TX	5810am			1000-1100	USA, KWHR Naalehu HI	9930as	11565pa		
0900-0959	USA, KHBI N Mariana Is	13840au			1000-1100	USA, Voice of America	5985pa	6165am	7405am	
0900-1000	USA, KTBN Salt Lk City UT	7510am			1000-1100	USA, WEWN Birmingham AL	11720pa	15425pa	9590am	
0900-1000	USA, KWHR Naalehu HI	11565pa	17780as		1000-1100	USA, WEWN Birmingham AL	5825na	7465eu		
0900-1000	USA, WEWN Birmingham AL	5825na	7465eu		1000-1100	USA, WGTG McCaysville GA	9400am			
0900-1000	USA, WGTG McCaysville GA	9400am			1000-1100	USA, WHRI Noblesville IN	6040am	9495am		
0900-1000	USA, WHRI Noblesville IN	5745am	7315am		1000-1100	USA, WJCR Upton KY	7490na			
0900-1000	USA, WJCR Upton KY	7490na			1000-1100	USA, WRNO New Orleans LA	15420am			
0900-1000	USA, WRNO New Orleans LA	15420am			1000-1059 mwh	USA, WSHB Cypress Crk SC	6095na			
0900-0959 th	USA, WSHB Cypress Crk SC	7535eu			1000-1059 s	USA, WSHB Cypress Crk SC	7395am			
0900-1000	USA, WWCN Nashville TN	2390am	3210am	5070am	1000-1100	USA, WWCN Nashville TN	2390am	5070am	5935am	
		5070am	5935am		1000-1100 as	USA, WWCN Nashville TN	3210am			
					1000-1100	USA, WWCN Nashville TN	15685am			
0900-1000	Zambia, Christian Voice	6065af			1000-1100	USA, WYFR Okeechobee FL	5950na			
0900-1000 vl	Zambia, R Zambia/ZNBC 1	7220do			1000-1030	Vietnam, Voice of	9840as	12020as	15010as	
0900-1000 vl	Zambia, R Zambia/ZNBC 2	6165do			1000-1100	Zambia, Christian Voice	6065af			
0900-1000 vl	Zimbabwe, Zimbabwe BC	5975do			1000-1100 vl	Zambia, R Zambia/ZNBC 1	7220do			
0915-1000	Ghana, Ghana Broadc Corp	6130do	7295do		1000-1100 vl	Zambia, R Zambia/ZNBC 2	6165do			
0915-0945	UK, BBC Asian Service	6065as	6195as	7235as	9580as	1030-1055	Belgium, R Vlaanderen Int	9925eu	15595eu	
		9740as	11750as	11765as	11955as	1030-1100 mwhf	Ethiopia, Radio	5990do	7110do	9705do
		15280as	15360as	21660as	11955as	1030-1100	Guam, AWR/KSDA	7455as	9530as	
0915-0945 as	UK, BBC Asian Service	6065as	6195as	7235as	1030-1035	Israel, Kol Israel	15640eu	15650na		
		9740as	11765as	11955as	1030-1100	Netherlands, Radio	6045eu	9860eu	12065as	
		15360as	21660as	15280as	1030-1100	South Korea, R Korea Intl	9650am		13710as	
0915-0930	UK, BBC World Service	11580eu	13745eu	15325eu	1030-1100	Sri Lanka, Sri Lanka BC	11835as	15120as	17850as	
		17695eu			1030-1055	UAE, Radio Dubai	13675eu	15395eu	21605eu	
0930-1000	Austria, R Austria Intl	1545as	17870au		1040-0920 tw	Vatican State, Vatican R	5883eu	9645eu	11740eu	
0930-1000	Canada, CKZN St John's	6160do			1045-1100 mwhf	Kazakhstan, R Almaty Intl	9505eu	9620eu	11840eu	
0930-1000	Georgia, Georgian Radio	11910eu			1045-1100 mwhf	USA, WRM/R Miami Intl	9955am			
0930-1000	Netherlands, Radio	12065as	13710as							
0930-1000	Philippines, FBC/R Intl	11935as								
0935-0950 s	Albania, TWR Tirana	9685eu								
0945-1000	UK, BBC Asian Service	6195as	9740as	11750as	11765as					
0945-1000 a	UK, BBC Asian Service	15360as	21660as							
0945-1000 a	UK, BBC Asian Service	6065as	7235as	9580as	11955as					
0945-1000 s	UK, BBC Slow Speed News	6065as	7235as	9580as	11955as					
		15280as								



Your Name in Lights!

... or at least in ink within the *Monitoring Times* Shortwave Guide. Please send us your "best catches" on the worldwide shortwave bands — QSLs, that is — and we will try to use them in future issues of *MT*. Your QSLs will be returned.

FREQUENCIES

1100-1200	Anguilla, Caribbean Beacon	11775am					17790as	
1100-1200	Australia, Radio	6080as	9580pa				6195ca	15220ca
1100-1200 vl	Australia, VL8A Alice Spg	2310do					5875eu	5965na
1100-1200 vl	Australia, VL8K Katherine	2485do					11760me	12095eu
1100-1200 vl	Australia, VL8T Tent Crk	2325do					15575as	17640eu
1100-1200	Bulgaria, Radio	15175eu	17585eu				6195am	15190sa
1100-1200	Canada, CFRX Toronto	6070do					7285na	9870na
1100-1200	Canada, CFVP Calgary	6030do					5810am	
1100-1200	Canada, CHNX Halifax	6130do					9385au	
1100-1200	Canada, CKZN St John's	6160do					15665as	
1100-1200	Canada, CKZU Vancouver	6160do					7510am	
1100-1200	Costa Rica, Adv World R	5030am	6150am	7375am	9725am		9930as	11565pa
		13750am					5985as	6160as
1100-1200	Costa Rica, RF Peace Intl	6980am	15050am				11705as	11720as
1100-1200	Ecuador, HCJB	12005am	15115am	21455am			5825na	15745eu
1100-1200 as	Eqt Guinea, R East Africa	15186af					6040am	9495am
1100-1200	Eqt Guinea, Radio Africa	9530as					7490na	
1100-1150	Germany, Deutsche Welle	15370af	15410af	17765af	17800af		1100-1200	USA, WRNO New Orleans LA
1100-1200	Iran, VOIRI	9585as	11830as	11875as	13605as		1100-1159 wf	USA, WSHB Cypress Crk SC
		15260as					1100-1159 stfa	USA, WSHB Cypress Crk SC
1100-1200 fas/vl	Italy, IRRS	7120va					1100-1200	USA, WWCR Nashville TN
1100-1200	Japan, R Japan/NHK World	6120na	9695as	11730as			1100-1200	USA, WYFR Okeechobee FL
1100-1200	Jordan, Radio	11690eu					1100-1130	Vietnam, Voice of
1100-1120 fa	Kazakhstan, R Almaty Intl	9620eu	11840eu				1100-1200	Zambia, Christian Voice
1100-1110	Liberia, LCN/R Liberia Int	5100do					1100-1200 vl	Zambia, R Zambia/ZNBC 1
1100-1200	Malaysia, Radio	7295do					1100-1200 vl	Zambia, R Zambia/ZNBC 2
1100-1200 irreg	Malaysia, RTM Kota Kinabalu	5980do					1104-1120	Pakistan, Radio
1100-1200 s	Malta, VO Mediterranean	9660eu					1115-1145	Nepal, Radio
1100-1125	Mozambique, R Maputo	11835do					1115-1130	UK, BBC World Service
1100-1125	Netherlands, Radio	6045eu	9860eu	12065as	13710as		11769eu	
1100-1200	New Zealand, R NZ Intl	9795pa					1115-1130 mtwh	UK, BBC World Service
1100-1200	North Korea, R Pyongyang	9640af	9975me	11335va	13650va		9750eu	11970eu
		15230sa					1125-1200	Netherlands, Radio
1100-1104	Pakistan, Radio	7110va	9645va	15530eu	17555eu		6045eu	9860eu
		17835eu					1130-1200 vl	China, China Radio Intl
1100-1130 as	Palau, KHBN/Voice of Hope	9965as					6995as	8660as
1100-1200 vl	Papua New Guinea, NBC	4890do					11445as	11700as
1100-1200	Singapore, R Singapore Int	6155as					15480as	
1100-1130 vl	Solomon Islands, SIBC	5020do					1130-1157	Czech Rep, Radio Prague
1100-1200	South Korea, R Korea Intl	7285af					1130-1200	Italy, AWR Europe
1100-1130	Sri Lanka, Sri Lanka BC	11835as	15120as	17850as			1130-1200	Myanmar, Voice of
1100-1200	Switzerland, Swiss R Intl	9810as	17515as				1130-1200	South Korea, R Korea Intl
1100-1200	Taiwan, Radio Taipei Intl	7445as					1130-1200	Sweden, Radio
1100-1200	UK, BBC African Service	6190af	11940af	15400af	17830af		1130-1200 as	UK, BBC Asian Service
		17885af	21660af				1130-1200	UK, BBC World Service
1100-1130	UK, BBC Asian Service	7235as	9580as	9700pa	9740as		11750as	15310as
		11750as	11765as	11955as	15310as		5965na	6195am
							12095eu	15220am
							15575as	17640eu
							1145-1200 f	Vatican State, Vatican R
							15595va	17550va
							15595va	17550va

SELECTED PROGRAMS

Sundays

1100	UK, BBC London (af): News Summary. One minute news update.	1100	UK, BBC London (am/eu): World News (Carib). See M 1100.	1110	UK, BBC London (am/eu): Sports for the Caribbean (Carib). See M 1110.
1100	UK, BBC London (am/as/eu): Newsdesk. See S 0000.	1105	UK, BBC London (am/eu): Caribbean Report (Carib). See M 1105.	1115	UK, BBC London (am/eu): Caribbean Magazine (Carib). See M 1115.
1101	UK, BBC London (af): In Praise of God. See S 0230.	1110	UK, BBC London (am/eu): Sports for the Caribbean (Carib). See M 1110.	1130	UK, BBC London (af): Pick of the World. See M 0130.
1130	UK, BBC London (af): Play of the Week. A different radio drama program each week.	1115	UK, BBC London (am/eu): Caribbean Magazine (Carib). See M 1115.	1130	UK, BBC London (af): Variable Feature. See S 0130.
1130	UK, BBC London (am/eu): Anything Goes. A variety of music and much more with Bob Holness.	1130	UK, BBC London (af): Jazzmatazz. See S 0730.	1130	UK, BBC London (am/eu): The Learning World. See H 0545.
1130	UK, BBC London (as): Blues World. Tony Russell returns with a new series about the blues.	1130	UK, BBC London (am/eu): Variable Feature. See S 0130.	1130	UK, BBC London (as): The Learning Zone (SAs). See S 1515.
1130	UK, BBC London (as): Play of the Week (EAs). A different radio drama program each week (alternative programming for East Asia).	1130	UK, BBC London (as): Meridian. See S 0630.	1145	UK, BBC London (as): From Our Own Correspondent. See S 0330.
		1145	UK, BBC London (as): BBC English (SAs). See S 1530.	1145	UK, BBC London (as): BBC English (SAs). See S 1530.

Wednesdays

1100	UK, BBC London (af/am/as/eu): Newsdesk. See S 0000.	1100	UK, BBC London (am/eu): World News (Carib). See M 1100.	1105	UK, BBC London (am/eu): Caribbean Report (Carib). See M 1105.
1100	UK, BBC London (am/eu): World News (Carib). A five minute news summary for listeners in the Caribbean.	1105	1105	1105	1105
1105	UK, BBC London (am/eu): Caribbean Report (Carib). Weekday coverage of current affairs in the Caribbean region with emphasis on political and economic analysis.	1110	UK, BBC London (am/eu): Sports for the Caribbean (Carib). See M 1110.	1115	UK, BBC London (am/eu): Caribbean Magazine (Carib). See M 1115.
1110	UK, BBC London (am/eu): Sports for the Caribbean (Carib). A round-up of the latest scores and sports news.	1115	1115	1115	1115
1115	UK, BBC London (am/eu): Caribbean Magazine (Carib). General news and features from around the islands.	1130	UK, BBC London (af): Variable Comedy/Quiz Feature. See M 1830.	1130	UK, BBC London (af): Andy Kershaw's World of Music. See M 1830.
1130	UK, BBC London (af): John Peel. Tracks from newly released albums and singles from the contemporary music scene.	1130	1130	1130	1130
1130	UK, BBC London (am/eu): Jazzmatazz. See S 0730.	1130	UK, BBC London (am/eu): World of Football. See W 0530.	1130	UK, BBC London (am/eu): Focus on Faith. See F 0230.
1130	UK, BBC London (as): Meridian. See S 0630.	1130	UK, BBC London (as): Meridian. See S 0630.	1130	UK, BBC London (as): BBC English (SAs). See S 1530.
1130	UK, BBC London (as): The Learning Zone (SAs). See S 1515.	1130	UK, BBC London (as): The Learning Zone (SAs). See S 1515.	1130	UK, BBC London (as): Meridian. See S 0630.
1145	UK, BBC London (as): BBC English (SAs). See S 1530.	1145	1145	1145	1145
			1145	UK, BBC London (as): The Learning Zone (SAs). See S 1515.	

Thursdays

1100	UK, BBC London (af/am/as/eu): Newsdesk. See S 0000.	1100	UK, BBC London (af/am/as/eu): News Summary. See S 1100.	1105	UK, BBC London (af): Variable Feature. See S 0130.
1100	UK, BBC London (am/eu): World News (Carib). See M 1100.	1105	1105	1105	1105
1105	UK, BBC London (am/eu): Caribbean Report (Carib). See M 1105.				

Saturdays

1100	UK, BBC London (af/am/as/eu): News Summary. See S 1100.	1100	UK, BBC London (af): African Perspective. See S 0630.	1105	UK, BBC London (af): People and Politics. See F 2130.
1101	UK, BBC London (af): Variable Feature. See S 0130.	1105	1105	1105	1105
1130	UK, BBC London (af): The Learning Zone (SAs). See F 2130.				
1130	UK, BBC London (as): Music Review. See S 0230.				

Tuesdays

1100	UK, BBC London (af/am/as/eu): Newsdesk. See S 0000.
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FREQUENCIES

1200-1300	Algeria, R Algiers Intl	11715me	15160me		1200-1300 as	UK, BBC Asian Service	11750as	15310as
1200-1300	Anguilla, Caribbean Beacon	11775am			1200-1215	UK, BBC Asian Service	5975as	7135as
1200-1300	Australia, Radio	5995pa	6020pa	6080as	1200-1300	UK, BBC World Service	5965na	6195am
		9580pa	9770as	12080as			11760me	9410eu
1200-1300 vl	Australia, VL8A Alice Spg	2310do					12095eu	9515na
1200-1300 vl	Australia, VL8K Katherine	2485do			1200-1300	USA, KAIJ Dallas TX	5810am	
1200-1300 vl	Australia, VL8T Tent Crk	2325do			1200-1259 as	USA, KHBI N Mariana Is	9385au	
1200-1300	Brazil, Radio Bras	15445na			1200-1259 mwf	USA, KHBI N Mariana Is	9355as	
1200-1300 vl	Canada, CBC N Quebec Svc	9625do			1200-1300	USA, KTBN Salt Lk City UT	7510am	
1200-1300	Canada, CFRX Toronto	6070do			1200-1300	USA, KWHR Naalehu HI	9930as	11565pa
1200-1300	Canada, CFVP Calgary	6030do			1200-1300	USA, Voice of America	6110as	6160as
1200-1300	Canada, CHNX Halifax	6130do					11705as	9645as
1200-1300	Canada, CKZN St John's	6160do			1200-1300	USA, WEWN Birmingham AL	5825na	9760as
1200-1300	Canada, CKZU Vancouver	6160do			1200-1300	USA, WGTR McCaysville GA	9400am	
1200-1229	Canada, R Canada Intl	6150as	11730as		1200-1300	USA, WHRI Noblesville IN	6040am	9495am
1200-1300	China, China Radio Intl	6950pa	7385pa	9565as	1200-1300	USA, WJCR Upton KY	7490na	
		9945as	11660as	11675as	1200-1300	USA, WRNO New Orleans LA	7395am	
1200-1230 vl	China, China Radio Intl	6995as	8660as	11445as	1200-1259 a	USA, WSHB Cypress Crk SC	9455am	
		12110as			1200-1259 mwh	USA, WSHB Cypress Crk SC	6095na	
1200-1300	Costa Rica, RF Peace Intl	6980am	15050am		1200-1300	USA, WWCR Nashville TN	5070am	7435am
1200-1300	Ecuador, HCJB	12005am	15115am	21455am	1200-1300	USA, WYFR Okeechobee FL	5950na	13845am
1200-1300 as	Eqt Guinea, R East Africa	15186af			1200-1230	Uzbekistan, R Tashkent	5060as	15685am
1200-1300	Eqt Guinea, Radio Africa	9530as			1200-1300	Zambia, Christian Voice	6065af	11970na
1200-1257	France, Radio France Intl	9805eu	11600as	13625ca	1200-1300 vl	Zambia, R Zambia/ZNBC 1	7220do	
		15195eu	15540af	17575am	1200-1300 vl	Zambia, R Zambia/ZNBC 2	6165do	
1200-1230	Iran, VOIRI	9585as	11830as	11875as	1203-1210	Croatia, Croatian Radio	7125eu	
		15260as			1207-1300 ocsnal	New Zealand, R NZ Intl	6105pa	
1200-1300 fas/vl	Italy, IRRS	7120va			1215-1300	Egypt, Radio Cairo	17595as	
1200-1300	Jordan, Radio	11690eu			1230-1300	Bangladesh, Bangla Betar	7185as	9550as
1200-1300	Malaysia, Radio	7295do			1230-1255	Belgium, R Vlaanderen Int	15545na	
1200-1300 irreg	Malaysia, RTM KotaKinabalu	5980do			1230-1300 s	Finland, YLE/R Finland	11900na	15400na
1200-1230	Mongolia, Voice of	12085au			1230-1300	Guam, AWR/KSDA	13720as	
1200-1250	Myanmar, Voice of	5990do			1230-1300	Serbia, Radio Yugoslavia	11835au	
1200-1225	Netherlands, Radio	6045eu	9860eu		1230-1300	Sri Lanka, Sri Lanka BC	9730as	15425as
1200-1206	New Zealand, R NZ Intl	9795pa			1230-1300	Sweden, Radio	13740as	15240au
1200-1300	Palau, KBN/Voice of Hope	9965as			1230-1300	Thailand, Radio	9655as	11905as
1200-1300 vl	Papua New Guinea, NBC	4890do			1230-1300	Turkey, Voice of	9630as	15290as
1200-1255	Poland, Polish R Warsaw	6095eu	7145eu	7270eu	1230-1300	UK, BBC World Service	5875eu	9750eu
		11815eu					11840eu	11895eu
1200-1300	Singapore, R Singapore Int	6155as					15325eu	17695eu
1200-1230	Switzerland, Swiss R Intl	6165eu	9535eu		1230-1300 a	USA, Voice of America	7768eu	17715eu
1200-1300	Taiwan, Radio Taipei Intl	7130as	9610au		1230-1300	Vietnam, Voice of	9840as	12020as
1200-1300	UK, BBC African Service	6190af	11940af	15105af	1240-1250	Greece, Voice of	11645af	15010as
		17885af	21640af	21660af	1240-1255 smtwh	UK, BBC Slow Speed News	7140me	11765af
1200-1300	UK, BBC Asian Service	6195as	7235as	9580as			11820me	13660af
		11750as	11955as	9740as	1245-1300	USA, WYFR Okeechobee FL	15695na	

SELECTED PROGRAMS

Sundays

1200 UK, BBC London (at/Eas): Play of the Week (from 1130). See S 1130.
 1200 UK, BBC London (am/as/eu): World News. See S 0100.
 1205 UK, BBC London (am/as/eu): Write On. See S 0030.
 1215 UK, BBC London (am/eu): In Praise of God. See S 0230.
 1215 UK, BBC London (as): Britain Today. See S 0045.
 1230 UK, BBC London (af/as): Letter from America. See S 0030.
 1230 UK, BBC London (as): Record News. See S 0815.
 1245 UK, BBC London (af/am/as/eu): Sports Roundup. See S 0145.

Mondays

1200 UK, BBC London (af/am/as/eu): World News. See S 0100.
 1200 UK, BBC London (am/eu): World News (Carib). See M 1100.
 1205 UK, BBC London (af/am/as/eu): World Business Report. See M 0905.
 1205 UK, BBC London (am/eu): World Business Report (Carib). See M 0905.
 1210 UK, BBC London (am/eu): Caribbean Report (Carib). See M 1105.
 1215 UK, BBC London (af/am/as/eu): Britain Today. See S 0045.
 1230 UK, BBC London (af): Westway. See M 0330.
 1230 UK, BBC London (am/eu): Health Matters. See S 0115.
 1230 UK, BBC London (as): Off the Shelf. See M 0330.
 1245 UK, BBC London (af/am/as/eu): Sports Roundup. See S 0145.

Tuesdays

1200 UK, BBC London (af/am/as/eu): World News. See S 0100.
 1200 UK, BBC London (am/eu): World News (Carib). See M 1100.
 1205 UK, BBC London (af/am/as/eu): World Business Report. See M 0905.
 1205 UK, BBC London (am/eu): World Business Report (Carib). See M 0905.

Wednesdays

1200 UK, BBC London (af/am/as/eu): World News. See S 0100.
 1200 UK, BBC London (am/eu): World News (Carib). See M 1100.
 1205 UK, BBC London (af/am/as/eu): World Business Report. See M 0905.
 1205 UK, BBC London (am/eu): World Business Report (Carib). See M 0905.
 1210 UK, BBC London (am/eu): Caribbean Report (Carib). See M 1105.
 1215 UK, BBC London (af/am/as/eu): Britain Today. See S 0045.
 1230 UK, BBC London (af): Variable Feature. See S 0130.
 1230 UK, BBC London (am/eu): Science Extra. See S 1501.
 1230 UK, BBC London (as): Off the Shelf. See M 0330.
 1245 UK, BBC London (af/am/as/eu): Sports Roundup. See S 0145.

Thursdays

1200 UK, BBC London (af/am/as/eu): World News. See S 0100.
 1200 UK, BBC London (am/eu): World News (Carib). See M 1100.
 1205 UK, BBC London (af/am/as/eu): World Business Report. See M 0905.
 1205 UK, BBC London (am/eu): World Business Report (Carib). See M 0905.
 1210 UK, BBC London (am/eu): Caribbean Report (Carib). See M 1100.

Fridays

1200 UK, BBC London (af/am/as/eu): World News. See S 0100.
 1200 UK, BBC London (am/eu): World News (Carib). See M 1100.
 1205 UK, BBC London (af/am/as/eu): World Business Report. See M 0905.
 1205 UK, BBC London (am/eu): World Business Report (Carib). See M 0905.
 1210 UK, BBC London (am/eu): Caribbean Report (Carib). See M 1105.
 1215 UK, BBC London (af/am/as/eu): Britain Today. See S 0045.
 1230 UK, BBC London (af): Westway. See M 0330.
 1230 UK, BBC London (am/eu): The Learning Zone. See S 1515.
 1230 UK, BBC London (as): Off the Shelf. See M 0330.
 1245 UK, BBC London (af/am/as/eu): Sports Roundup. See S 0145.

Saturdays

1200 UK, BBC London (af/am/as/eu): World News. See S 0100.
 1205 UK, BBC London (af/am/as/eu): World Business Report. See M 0905.
 1215 UK, BBC London (af/am/eu): A Jolly Good Show. See S 0630.
 1215 UK, BBC London (as): Britain Today. See S 0045.
 1245 UK, BBC London (af): Football Extra. See F 1505.
 1245 UK, BBC London (am/eu): Short Story. See S 0715.
 1245 UK, BBC London (as): Variable Comedy/Quiz Feature. See M 1830.
 1255 UK, BBC London (af): Spotlight. See F 1555.

FREQUENCIES

1300-1400	Anguilla, Caribbean Beacon	11775am				1300-1400	UK, BBC Asian Service	5990as	6195as	9740as	11750as
1300-1330	Australia, Radio	5995pa	6020pa	6080as	9580pa	1300-1400	UK, BBC World Service	15310as			
		9770as						5965na	6195am	9410eu	9515na
1300-1400 vl	Australia, VL8A Alice Spg	2310do						9590na	11760me	12095eu	15220am
1300-1400 vl	Australia, VL8K Katherine	2485do						15485eu	15565eu	15575as	17640eu
1300-1400 vl	Australia, VL8T Tent Crk	2325do						17705eu			
1300-1320	Brazil, Radio Bras	15445na				1300-1400	USA, KAIJ Dallas TX	13815am			
1300-1400 vl	Canada, CBC N Quebec Svc	9625do				1300-1359	USA, KHBI N Mariana Is	9355as			
1300-1400	Canada, CFRX Toronto	6070do				1300-1400	USA, KJES Mesquite NM	11715am			
1300-1400	Canada, CFVP Calgary	6030do				1300-1400	USA, KNLS Anchor Point AK	7365as			
1300-1400	Canada, CHNX Halifax	6130do				1300-1400	USA, KTBN Salt Lk City UT	7510am			
1300-1400	Canada, CKZN St John's	6160do				1300-1400	USA, KWHR Nalehu HI	9930as	11565pa		
1300-1400	Canada, CKZU Vancouver	6160do				1300-1400	USA, Voice of America	6160as	9645as	9760as	11705as
1300-1330	Canada, R Canada Intl	9640na	11855na					11715as	15425as		
1300-1400	China, China Radio Intl	6140as	7385pa	9945as	11660as	1300-1400	USA, WEWN Birmingham AL	9455na	11875na	15745eu	
		11675as	11980as			1300-1400	USA, WGTC McCaysville GA	9400am			
1300-1400	Costa Rica, RF Peace Intl	6980am	15050am			1300-1400	USA, WHRI Noblesville IN	6040am			
1300-1400	Ecuador, HCJB	12005am	15115am	21455am		1300-1400	USA, WJCR Upton KY	7490na			
1300-1330	Egypt, Radio Cairo	17595as				1300-1400	USA, WRMI/R Miami Intl	9955am			
1300-1400	Eqt Guinea, R East Africa	15186af				1300-1400	USA, WRNO New Orleans LA	7395am			
1300-1400	Eqt Guinea, Radio Africa	9530as				1300-1359 tf	USA, WSHB Cypress Crk SC	9455am			
1300-1400 vl	Georgia, Voice of Hope	9310as				1300-1359 smtwha	USA, WSHB Cypress Crk SC	9430na			
1300-1330 s	Germany, Universal Life	9710eu	12000as			1300-1400	USA, WWCR Nashville TN	9475am	12160am	13845am	15685am
1300-1400 fas/vl	Italy, IRRS	7120va				1300-1400	USA, WYFR Okeechobee FL	5950na	11830na	11970na	13695na
1300-1400	Jordan, Radio	11690eu						15695na			
1300-1310	Liberia, LCN/R Liberia Int	5100do				1300-1400	Zambia, Christian Voice	6065af			
1300-1400	Malaysia, Radio	7295do				1300-1400	Zambia, R Zambia/ZNBC 1	7220do			
1300-1400 irreg	Malaysia, RTM Kota Kinabalu	5980do				1300-1400	Zambia, R Zambia/ZNBC 2	6165do			
1300-1400 occsna	New Zealand, R NZ Intl	6105pa				1315-1400	Bhutan, Bhutan BC Service	5030do			
1300-1330 s	Norway, Radio Norway Intl	9590eu	9905as	13790am	13800va	1330-1400	Australia, Radio	6020pa	6080as	9580pa	9770as
1300-1400	Palau, KBN/Voice of Hope	9985as				1330-1355	Austria, R Austria Intl	6155eu	13730na		
1300-1400 vl	Papua New Guinea, NBC	4890do				1330-1359	Canada, R Canada Intl	6150as	9535as	9640na	11855na
1300-1400	Philippines, FEBC/R Intl	11995as				1330-1400	China, Heilongjiang PBS	4840do			
1300-1356	Romania, R Romania Intl	15250eu	15390eu	17735eu	17745eu	1330-1400	Guam, AWR/KSDA	9650as	13720as		
1300-1400	Russia, Voice of Russia WS	7130me	7390as	9450as	9470me	1330-1400	India, All India Radio	9545as	11620as	13710as	
1300-1400 as	S Africa, Channel Africa	9440af	17675af	17870af		1330-1400	Netherlands, Radio	9890as	15585as		
1300-1400	Singapore, R Singapore Int	6155as				1330-1400	Sweden, Radio	13740as	15240na	17515au	
1300-1400	Sri Lanka, Sri Lanka BC	9730as	15425as			1330-1355	UAE, Radio Dubai	13630eu	13675eu	15395eu	17825eu
1300-1400	Switzerland, Swiss R Intl	7230as	7480as			1330-1400	Uzbekistan, R Tashkent	5060as	5975as	6025as	9715as
1300-1330	Turkey, Voice of	9630as	15290as			1330-1400	Vietnam, Voice of	9840eu	12020as	15010as	
1300-1400	UK, BBC African Service	6190af	11940af	15105af	15420af	1335-1345	Greece, Voice of	9375eu	9590na	15175na	15630na
		17810af	17830af	17885af	21640af	1345-1400	Liberia, Radio Veritas	5470do			
		21660af				1345-1400	Vatican State, Vatican R	13765au	15540au		

SELECTED PROGRAMS

Sundays

1300 Romania, R Romania Intl: Radio Newsreel. World and Bulgarian news.
 1300 Switzerland, Swiss R Intl: News. See S 0400.
 1300 UK, BBC London (af/am/as/eu): Newshour. A comprehensive look at the major topics of the day, plus up-to-the-minute international and British news.
 1305 Switzerland, Swiss R Intl: Newsnet. See S 0405.
 1315 Romania, R Romania Intl: Panorama (Radio Tour). Holiday opportunities, trekking, leisure, picturesque landscape, fun, hunting, fishing, cooking tips, stamp collecting, and hobby land.

Mondays

1300 Romania, R Romania Intl: Radio Newsreel. See S 1300.
 1300 Switzerland, Swiss R Intl: News. See S 0400.
 1300 UK, BBC London (af/am/as/eu): Newshour. See S 1300.
 1305 Switzerland, Swiss R Intl: Newsnet. See S 0405.
 1315 Romania, R Romania Intl: Pro Memoria. History, archaeology, numismatics, treasures, museums, the trail of time and living history.
 1340 Romania, R Romania Intl: Romanian Itineraries. Tourist attractions in Romania.
 1352 Romania, R Romania Intl: Sports Roundup. The latest results in Romania matches.

Tuesdays

1300 Romania, R Romania Intl: Radio Newsreel. See S 1300.
 1300 Switzerland, Swiss R Intl: News. See S 0400.
 1300 UK, BBC London (af/am/as/eu): Newshour. See S 1300.
 1305 Switzerland, Swiss R Intl: Newsnet. See S 0405.
 1315 Romania, R Romania Intl: Business Club. Economic agenda, world trade, investments in Romania, legislation, the stock exchange, business opportunities, and market wrap.
 1325 Romania, R Romania Intl: Inside Romania. An historical perspective of life in Romania.
 1331 Romania, R Romania Intl: Romanian Literature. Biographical sketch of a Romanian author.

Wednesdays

1300 Romania, R Romania Intl: Radio Newsreel. See S 1300.
 1300 Switzerland, Swiss R Intl: News. See S 0400.
 1300 UK, BBC London (af/am/as/eu): Newshour. See S 1300.
 1305 Switzerland, Swiss R Intl: Newsnet. See S 0405.
 1315 Romania, R Romania Intl: Society. Everyday life, grassroot people, "why me?" frame of mind, she and he, the third age, and point-counterpoint.
 1325 Romania, R Romania Intl: Youth Club. Lively topics for younger listeners, music, and letterbox.

1353 Romania, R Romania Intl: Sports Roundup. See M 1352.

Thursdays

1300 Romania, R Romania Intl: Radio Newsreel. See S 1300.
 1300 Switzerland, Swiss R Intl: News. See S 0400.
 1300 UK, BBC London (af/am/as/eu): Newshour. See S 1300.
 1305 Switzerland, Swiss R Intl: Newsnet. See S 0405.
 1315 Romania, R Romania Intl: Citizens of the Same Country. What brings us together, destiny, religion, who we are, and identities and standards.
 1325 Romania, R Romania Intl: Romanian Musicians. Musical selections of the works of a Romanian musician.

1335 Romania, R Romania Intl: Partners in a Changing World. An interview with a representative of a visiting country.

Fridays

1300 Romania, R Romania Intl: Radio Newsreel. See S 1300.
 1300 Switzerland, Swiss R Intl: News. See S 0400.
 1300 UK, BBC London (af/am/as/eu): Newshour. See S 1300.
 1305 Switzerland, Swiss R Intl: Newsnet. See S 0405.
 1315 Romania, R Romania Intl: A Time for the Future. No information available.
 1325 Romania, R Romania Intl: The Skylark. Romanian folk music.

1335 Romania, R Romania Intl: Listeners' Letterbox. Mailbag program with taped messages.
 1352 Romania, R Romania Intl: The Listeners Club. Information about how to join and how it operates.
 1354 Romania, R Romania Intl: Sports Roundup. See M 1352.

Saturdays

1300 Romania, R Romania Intl: Radio Newsreel. See S 1300.
 1300 Switzerland, Swiss R Intl: News. See S 0400.
 1300 UK, BBC London (af/am/as/eu): Newshour. See S 1300.
 1305 Switzerland, Swiss R Intl: Newsnet. See S 0405.
 1315 Romania, R Romania Intl: World of Culture. A review of cultural activities of the last week.
 1315 Switzerland, Swiss R Intl: Capital Letters (2/4). See S 0415.
 1315 Switzerland, Swiss R Intl: Sounds Good (3/5). See S 0415.
 1315 Switzerland, Swiss R Intl: The Name Game (1). See S 0415.
 1337 Romania, R Romania Intl: Inside Romania. See T 1325.
 1348 Romania, R Romania Intl: Bucharest along the Centuries. An historical look at Romania's capital city.

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FREQUENCIES

1400-1500	Anguilla, Caribbean Beacon	11775am				1400-1455 as	S Africa, Channel Africa	9440af	17675af	17870af
1400-1430	Australia, Radio	5995pa	6020pa	6080as	9770as	1400-1500	Singapore, SBC Radio One	6155do		
		11660as	12080as			1400-1500	Singapore, R Singapore Int'l	6155as		
1400-1500 vl	Australia, VL8A Alice Spg	2310do				1400-1500	Sri Lanka, Sri Lanka BC	9730as	15425as	
1400-1500 vl	Australia, VL8W Katherine	2485do				1400-1500	Switzerland, Swiss R Int'l	9575as	15265as	
1400-1500 vl	Australia, VL8T Tent Crk	2325do				1400-1430	Thailand, Radio	9530as	9655as	11905as
1400-1500 vl	Canada, CBC N Quebec Svc	9625do				1400-1500	UK, BBC African Service	6190af	11860af	11940af
1400-1500	Canada, CFRX Toronto	6070do				1400-1500	UK, BBC Asian Service	17830af	17885af	21470af
1400-1500	Canada, CFVP Calgary	6030do				1400-1500	UK, BBC World Service	5990as	6195as	9740as
1400-1500	Canada, CHNX Halifax	6130do				1400-1500	UK, BBC World Service	9410eu	9515na	9590na
1400-1500	Canada, CKZN St John's	6160do				1400-1500	15220na	15485eu	15565eu	15575as
1400-1500	Canada, CKZU Vancouver	6160do				1400-1500	17640eu	17705eu	17840am	
1400-1500 smtwhf	Canada, R Canada Intl	9640na	11855na			1400-1500	USA, KAIJ Dallas TX	13815am		
1400-1500	China, China Radio Intl	7160as	7260as	7405na	9535as	1400-1459	USA, KHBI N Mariana Is	9355as		
		9700va	11825as			1400-1500	USA, KTNB Salt Lk City UT	7510am		
1400-1500	Costa Rica, RF Peace Intl	7385am	15050am			1400-1500	USA, KWHR Maalehu HI	9930as	11565pa	
1400-1430	Czech Rep, Radio Prague	13580na	21700af			1400-1500	USA, Voice of America	6160as	7125as	7215as
1400-1500	Ecuador, HCJB	12005am	15115am	21455am		1400-1500	9760as	11705as	15205as	15395as
1400-1500 as	Eqt Guinea, R East Africa	15186af				1400-1500	USA, WEWN Birmingham AL	9455na	11875na	15745eu
1400-1457	France, Radio France Intl	5220as	7110as	11910as	12030as	1400-1500	USA, WGTG McCaysville GA	9400am		
		15405as	17560me			1400-1500	USA, WHRI Noblesville IN	6040am	15105am	
1400-1430 yi	Georgia, Voice of Hope	9310as				1400-1500	USA, WJCR Upton KY	7490na		
1400-1500	India, All India Radio	9545as	11620as	13710as		1400-1430 s	USA, WRM/R Miami Int'l	9955am		
1400-1430	Israel, Kol Israel	15650na	17535na			1400-1500	USA, WRM/R Miami Int'l	9955am		
1400-1500 fas/vl	Italy, IRRS	7120va				1400-1500	USA, WRNO New Orleans LA	7395am		
1400-1500	Japan, R Japan/NHK World	9505na	11730as	11880af		1400-1500	USA, WWCR Nashville TN	9475am	12160am	13845am
1400-1500	Jordan, Radio	11690eu				1400-1500	USA, WYFR Okeechobee FL	5950na	11830na	17760ca
1400-1500	Liberia, Radio Veritas	5470do				1400-1405	Vatican State, Vatican R	13765au	15540au	
1400-1500	Malaysia, Radio	7295do				1400-1500	Zambia, Christian Voice	6065af		
1400-1500 vl	Malaysia, RTM Kuching	4895do	7160do			1400-1500 vl	Zambia, R Zambia/ZNBC 1	4910do		
1400-1500 irreg	Malaysia, RTM KotaKinabalu	5980do				1400-1500 vl	Zambia, R Zambia/ZNBC 2	6165do		
1400-1430	Mexico, Radio Mexico Intl	9705na				1415-1420	Nepal, Radio	3230do	5005do	
1400-1500	Netherlands, Radio	9890as	15585as			1430-1500	Australia, Radio	5995pa	6020pa	6080as
1400-1500 occsna	New Zealand, R NZ Intl	6105pa				1430-1500	9770as	11660as	9500as	
1400-1430 s	Norway, Radio Norway Intl	13800as				1430-1500 smtwhf	Canada, R Canada Intl	9640na	11855na	
1400-1500 as	Palau, KHBN/Voice of Hope	9985as				1430-1500 vl	China, China Radio Intl	6995as	8660as	9880as
1400-1500 vl	Papua New Guinea, NBC	4890do				1430-1500	Guam, AWR/KSDA	7400as		
1400-1500	Philippines, FEB/R Intl	11995as				1430-1445 mtwhf	USA, WRM/R Miami Int'l	9955am		
1400-1500	Russia, Voice of Russia WS	4730as	4940as	4975as	5925me	1440-1500	Myanmar, Voice of	5990do		
		7115af	7130me	7235as	7245me	1450-1500	Vatican State, Vatican R	9875au	11640au	
		7390as	9470af	9635me	9725as					
		9830me	9840me	11500as						

SELECTED PROGRAMS

Sundays

1400 Switzerland, Swiss R Int'l: News. Five minutes of world news.
 1400 UK, BBC London (af/am/as/eu): News Summary. See S 1100.
 1401 UK, BBC London (af/am/as/eu): Variable Feature. See S 0130.
 1401 UK, BBC London (am/as/eu): Variable Feature. See S 0130.
 1401 UK, BBC London (am/eu/af/as): Newstalk. Robin Lustig and a well-known BBC correspondent offer listeners a chance to air their views on the main issues of the week.
 1405 Switzerland, Swiss R Int'l: Newsnet. Analyses of the main international stories by Swiss-based specialists.
 1415 Switzerland, Swiss R Int'l: Capital Letters (2/4). SRI's bimonthly mailbag and listener contact program.
 1415 Switzerland, Swiss R Int'l: Sounds Good (3/5). Music from Switzerland and the people who make it.
 1415 Switzerland, Swiss R Int'l: The Name Game (1). A chance for you to test your knowledge of Switzerland and win prizes.
 1430 Switzerland, Swiss R Int'l: Rendez-vous with Switzerland. A relaxing blend of music and interviews.
 1430 UK, BBC London (afas): Variable Feature. See S 0130.
 1445 UK, BBC London (af): The Farming World. See S 0815.
 1445 UK, BBC London (am/eu): Letter from America. See S 0030.
 1445 UK, BBC London (as): Health Matters. See S 0115.

Mondays

1400 Switzerland, Swiss R Int'l: News. See S 1400.
 1400 UK, BBC London (af/am/as/eu): World News. See S 0100.
 1400 UK, BBC London (as): East Asia Today (EAs). See S 2300.
 1405 Switzerland, Swiss R Int'l: Newsnet. See S 1405.
 1405 UK, BBC London (af/am/as/eu): Outlook. An up-to-the-minute mix of conversation, controversy and color from around the world.
 1430 Switzerland, Swiss R Int'l: Rendez-vous with Switzerland. See S 1430.
 1430 UK, BBC London (af/am/eu): Pop Science. See S 1730.

Tuesdays

1400 Switzerland, Swiss R Int'l: News. See S 1400.
 1400 UK, BBC London (af/am/as/eu): World News. See S 0100.
 1400 UK, BBC London (as): East Asia Today (EAs). See S 2300.
 1405 Switzerland, Swiss R Int'l: Newsnet. See S 1405.
 1405 UK, BBC London (af/am/as/eu): Outlook. See M 1405.
 1430 Switzerland, Swiss R Int'l: Rendez-vous with Switzerland. See S 1430.
 1430 UK, BBC London (af/am/eu): Multitrack Hit-List. See M 1615.
 1430 UK, BBC London (as): Discovery. See T 0230.

Wednesdays

1400 Switzerland, Swiss R Int'l: News. See S 1400.
 1400 UK, BBC London (af/am/as/eu): World News. See S 0100.
 1400 UK, BBC London (as): East Asia Today (EAs). See S 2300.
 1405 Switzerland, Swiss R Int'l: Newsnet. See S 1405.
 1405 UK, BBC London (af/am/as/eu): Outlook. See M 1405.
 1430 Switzerland, Swiss R Int'l: Rendez-vous with Switzerland. See S 1430.
 1430 UK, BBC London (af/am/eu): Megamix. See T 1615.
 1430 UK, BBC London (as): World of Football. See W 0530.

Thursdays

1400 Switzerland, Swiss R Int'l: News. See S 1400.
 1400 UK, BBC London (af/am/as/eu): World News. See S 0100.
 1400 UK, BBC London (as): East Asia Today (EAs). See S 2300.
 1405 Switzerland, Swiss R Int'l: Newsnet. See S 1405.
 1405 UK, BBC London (af/am/as/eu): Outlook. See M 1405.
 1430 Switzerland, Swiss R Int'l: Rendez-vous with Switzerland. See S 1430.
 1430 UK, BBC London (af/am/eu): Multitrack X-Press. See W 1615.
 1430 UK, BBC London (as): Assignment. See H 0230.

Fridays

1400 Switzerland, Swiss R Int'l: News. See S 1400.
 1400 UK, BBC London (af/am/as/eu): World News. See S 0100.
 1400 UK, BBC London (as): East Asia Today (EAs). See S 2300.

1405 Switzerland, Swiss R Int'l: Newsnet. See S 1405.

1405 UK, BBC London (af): Focus on Africa. See S 1705.
 1405 UK, BBC London (am/as/eu): Outlook. See M 1405.
 1430 Switzerland, Swiss R Int'l: Rendez-vous with Switzerland. See S 1430.

1430 UK, BBC London (af/am/eu): Multitrack Alternative. Latest developments on the British music scene.

1430 UK, BBC London (as): Science in Action. See M 0930.

Saturdays
 1400 Switzerland, Swiss R Int'l: News. See S 1400.
 1400 UK, BBC London (af/am/as/eu): World News. See S 0100.
 1405 Switzerland, Swiss R Int'l: Newsnet. See S 1405.
 1405 UK, BBC London (af/am/as/eu): Sportsworld. The weekly sports magazine.
 1415 Switzerland, Swiss R Int'l: Capital Letters (2/4). See S 1415.
 1415 Switzerland, Swiss R Int'l: Sounds Good (3/5). See S 1415.
 1415 Switzerland, Swiss R Int'l: The Name Game (1). See S 1415.
 1430 Switzerland, Swiss R Int'l: Rendez-vous with Switzerland. See S 1430.

Macintosh Software

SHORTWAVE NAVIGATOR
FREQUENCY VALET • UTCLOCK

FREQUENCIES/PROGRAMS/COMPUTER CONTROL
(DRAKE • KENWOOD • JRC)

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WILLOW PARK, TX 76087

FREQUENCIES

1500-1600	Anguilla, Caribbean Beacon	11775am				1500-1530 twhfa	Seychelles, FEBA Radio	11600as
1500-1600	Australia, Radio	5995pa	6020pa	6080as	9500as	1500-1545 sm	Seychelles, FEBA Radio	11600as
		9770as	11660as	12080as		1500-1558 mtwhfa	Seychelles, FEBA Radio	9810as
1500-1600 vl	Australia, VL8A Alice Spg	2310do				1500-1600	Singapore, SBC Radio One	6155do
1500-1600 vl	Australia, VL8K Katherine	2485do				1500-1600	Singapore, R Singapore Int	6155as
1500-1600 vl	Australia, VL8T Tent Crk	2325do				1500-1600	South Korea, R Korea Intl	5975as
1500-1600 vl	Canada, CBC N Quebec Svc	9625do				1500-1600	Sri Lanka, Sri Lanka BC	9730as
1500-1600	Canada, CFRX Toronto	6070do				1500-1530	UK, BBC African Service	6190af
1500-1600	Canada, CFVP Calgary	6030do					15420af	11860af
1500-1600	Canada, CHNX Halifax	6130do					15420af	17830af
1500-1600	Canada, CKZN St John's	6160do					21660af	21470af
1500-1600	Canada, CKZU Vancouver	6160do						21490af
1500-1600 s	Canada, R Canada Intl	9640na	11855na			1500-1600	UK, BBC Asian Service	5975as
1500-1600	China, China Radio Intl	7160as	7405na	9785as		1500-1600	UK, BBC World Service	5875eu
1500-1600	Costa Rica, RF Peace Intl	7385am	15050am				9590na	12040eu
1500-1600	Ecuador, HCJB	12005am	15115am	21455am		1500-1600	USA, KAJ Dallas TX	13815am
1500-1600 as	Eqt Guinea, R East Africa	15186af				1500-1600	USA, KTBN Salt Lk City UT	15590am
1500-1530 vl	Georgia, Voice of Hope	12120as				1500-1600	USA, KWHR Naalehu HI	7560pa
1500-1600	Guam, TWR/KTWR	15105as				1500-1600	USA, Voice of America	9930as
1500-1600 fas/vl	Italy, IRRS	3985va					6110as	6160as
1500-1600	Japan, R Japan/NHK World	7200as	9505na	9750as	11730as		9575as	9760as
1500-1600	Jordan, Radio	11690eu						15205as
1500-1510	Liberia, LCN/R Liberia Int	5100do				1500-1600	USA, WEVN Birmingham AL	11875na
1500-1600	Malaysia, Radio	7295do				1500-1600	USA, WGTG McCaysville GA	9400am
1500-1600 irreg	Malaysia, RTM KotaKinabalu	5980do				1500-1600	USA, WHRI Noblesville IN	13760am
1500-1530	Mexico, Radio Mexico Intl	9705na				1500-1600	USA, WJCR Upton KY	7490na
1500-1530	Mongolia, Voice of	9720as	12085as			1500-1600	USA, WRNO New Orleans LA	15420am
1500-1515 s	Myanmar, Voice of	5990do				1500-1600	USA, WWCR Nashville TN	9475am
1500-1525	Netherlands, Radio	9890as	15585as			1500-1600	USA, WYFR Okeechobee FL	11830na
1500-1600 occsnal	New Zealand, R NZ Intl	6105pa				1500-1530	Vatican State, Vatican R	9875au
1500-1600	Nigeria, Voice of	7255af	15120af			1500-1600	Zambia, Christian Voice	6065af
1500-1600	North Korea, R Pyongyang	9640af	9975me	11335ca	11735sa	1500-1600 vl	Zambia, R Zambia/ZNBC 1	4910do
		13650va				1500-1600 vl	Zambia, R Zambia/ZNBC 2	6165do
1500-1530 as	Palau, KBHN/Voice of Hope	9985as				1530-1600 vl	Georgia, Voice of Hope	6290eu
1500-1600 vl	Papua New Guinea, NBC	4890do				1530-1600	Iran, VOIRI	6095as
1500-1600	Philippines, FEBG/R Intl	11995as				1530-1600	UK, BBC African Service	6190af
1500-1600	Russia, Voice of Russia WS	4730me	4940me	4975me	6175af	1530-1545	UK, BBC Asian Service	21470af
		7115af	7210af	7275af	9470af	1545-1600 sh	Bangladesh, Bangla Betar	4880do
		9505af	9585af	9635af		1545-1600	Israel, Kol Israel	11605eu
1500-1600 sm	Russia, Voice of Russia WS	6005af				1550-1600 a	Vatican State, Vatican R	15650va
1500-1530	S Africa, Channel Africa	9440af					9875va	11640va

SELECTED PROGRAMS

Sundays

1500 UK, BBC London (af/as): News Summary. See S 1100.
 1500 UK, BBC London (am/eu): World News. See S 0100.
 1501 UK, BBC London (af): Science Extra. Either Soundbyte (virtual games and the Internet) or Seeing Stars (a look at the night skies).
 1501 UK, BBC London (as): Play of the Week (SAs). A different radio drama program each week (alternative programming for South Asia).
 1501 UK, BBC London (as): Science Extra. See S 1501.
 1505 UK, BBC London (am/eu): Sports Roundup. See S 0145.
 1515 UK, BBC London (af): The Learning Zone. For people who want to learn more about subjects such as science, health, the world and work and literature while practicing English listening skills.
 1515 UK, BBC London (af): Waveguide (4). The latest information on international broadcasting with reviews of receivers and news about reception.
 1515 UK, BBC London (am/eu): Concert Hall. Classical music concerts.
 1515 UK, BBC London (as): Variable Feature. See S 0130.
 1530 UK, BBC London (af): BBC English. For learners of English.
 1530 UK, BBC London (as): Blues World. See S 1130.

Mondays

1500 UK, BBC London (af/am/as/eu): World News. See S 0100.
 1500 UK, BBC London (as): East Asia Today (EAs). See S 2300.
 1505 UK, BBC London (af): Focus on Africa. See S 1705.
 1505 UK, BBC London (am/as/eu): Sports Roundup. See S 0145.
 1515 UK, BBC London (am/as/eu): Westway Access. See M 0030.
 1530 UK, BBC London (af): The Learning Zone. See S 1515.
 1530 UK, BBC London (an/eu): Blues World. See S 1130.
 1530 UK, BBC London (as): Meridian. See S 0630.
 1530 UK, BBC London (as): Outlook (EAs). See M 1405.
 1545 UK, BBC London (af): BBC English. See S 1530.
 1555 UK, BBC London (as): Music Brief (EAs). A five-minute interlude.

Tuesdays

1500 UK, BBC London (af/am/as/eu): World News. See S 0100.
 1500 UK, BBC London (as): East Asia Today (EAs). See S 2300.
 1505 UK, BBC London (af): Focus on Africa. See S 1705.

Wednesday

1500 UK, BBC London (af/am/as/eu): World News. See S 0100.
 1500 UK, BBC London (as): East Asia Today (EAs). See S 2300.
 1505 UK, BBC London (af): Focus on Africa. See S 1705.
 1505 UK, BBC London (am/as/eu): Sports Roundup. See S 0145.
 1515 UK, BBC London (am/eu): Outlook. See M 1405.
 1515 UK, BBC London (as): Science Extra. See S 1501.
 1530 UK, BBC London (af): The Learning Zone. See S 1515.
 1530 UK, BBC London (as): Outlook (EAs). See M 1405.
 1545 UK, BBC London (af): The Learning Zone. See S 1515.
 1555 UK, BBC London (as): Science View (EAs). See S 0040.

Thursdays

1500 UK, BBC London (af/am/as/eu): World News. See S 0100.
 1500 UK, BBC London (as): East Asia Today (EAs). See S 2300.
 1505 UK, BBC London (af): Focus on Africa. See S 1705.
 1505 UK, BBC London (am/as/eu): Sports Roundup. See S 0145.
 1515 UK, BBC London (am/eu): Outlook. See M 1405.
 1515 UK, BBC London (as): Science Extra. See S 1501.
 1530 UK, BBC London (af): The Learning Zone. See S 1515.
 1530 UK, BBC London (am/eu): The Vintage Chart Show. See M 0730.
 1530 UK, BBC London (as): Composer of the Month. See M 1930.
 1530 UK, BBC London (as): Outlook (EAs). See M 1405.
 1545 UK, BBC London (af): BBC English. See S 1530.
 1555 UK, BBC London (as): Take Five (EAs). See T 0455.

Fridays

1500 UK, BBC London (af/am/as/eu): World News. See S 0100.
 1500 UK, BBC London (as): East Asia Today (EAs). See S 2300.

1505 UK, BBC London (af): Focus on Africa. See S 1705.

1505 UK, BBC London (am/as/eu): Football Extra. A review of the week's action and the upcoming weekend matches.
 1515 UK, BBC London (am/as/eu): Variable Feature. See S 0130.
 1530 UK, BBC London (af): The Learning Zone. See S 1515.
 1530 UK, BBC London (am/eu): Science in Action. See M 0930.
 1530 UK, BBC London (as): Meridian. See S 0630.
 1530 UK, BBC London (as): Outlook (EAs). See M 1405.
 1545 UK, BBC London (af): The Learning Zone. See S 1515.
 1555 UK, BBC London (as): Spotlight (EAs). Focus on the theater.

Saturdays

1500 UK, BBC London (af/am/as/eu): World News. See S 0100.
 1505 UK, BBC London (af/am/as/eu): Sportsworld. See A 1405.

HAUSER'S HIGHLIGHTS

HUNGARY: R. BUDAPEST

Z-98 English to Europe

UTC	kHz
1900	3975, 7170
2100	3975, 11700
To North America	
0100	6120, 9580
0230	9840, 11900
(Andreas Volk, BC-DX)	
Another version shows 11910, not 11900, at 0230	
(Volk, EDXP)	



FREQUENCIES

1600-1700	Anguilla/Caribbean Beacon	11775am			1600-1638	UAE, Radio Dubai	13630au	13675eu	15395eu	21605eu
1600-1700	Australia, Radio	5995pa	6020pa	6080as	1600-1615	UK, BBC Asian Service	3915as	5975as	5990as	6195as
		9770as	11660as	12080as	1600-1700	UK, BBC Asian Service	7135as	9740as	11750as	
1600-1700 vl	Australia, VL8A Alice Spg	2310do			1600-1700	UK, BBC World Service	6195eu	9410eu	9515na	12095eu
1600-1700 vl	Australia, VL8K Katherine	2485do					15485eu	15575eu	17705eu	17840am
1600-1700 vl	Australia, VL8T Tent Crk	2325do			1600-1700	USA, KAJ Dallas TX	13815am			
1600-1610	Bangladesh, Bangla Betar	4880do	15520do		1600-1700	USA, KTBN Salt Lk City UT	15590am			
1600-1700 vl	Canada, CBC N Quebec Svc	9625do			1600-1700	USA, KWHR Nalehu HI	7560pa	9930as		
1600-1700	Canada, CFRX Toronto	6070do			1600-1700	USA, Voice of America	6035af	6110as	7125as	7215as
1600-1700	Canada, CFVP Calgary	6030do					9575as	9645as	9760as	11920af
1600-1700	Canada, CHNX Halifax	6130do			1600-1700	USA, WMLK Bethel PA	9465am	12040af	13600af	15205as
1600-1700	Canada, CKZN St John's	6160do			1600-1700	USA, WRNO New Orleans LA	15420am	15225af	15395as	15410af
1600-1700	Canada, CKZU Vancouver	6160do					17895af			
1600-1630 s	Canada, R Canada Intl	9640na	11855na		1600-1700	USA, WEWN Birmingham AL	11875na	13615na	15745eu	
1600-1659	Canada, R Canada Intl	6140as	7150as		1600-1700	USA, WGTV McCaysville GA	9400am			
1600-1700	China, China Radio Intl	9565as	9620af		1600-1700	USA, WHRI Noblesville IN	13760am			
1600-1700 as	Costa Rica, Adv World R	9725am	11870am	13750am	1600-1700	USA, WINB Red Lion PA	13790af			
1600-1700	Costa Rica RF Peace Intl	7385am	15050am		1600-1700	USA, WJCR Upton KY	7490na			
1600-1700	Ethiopia, Radio	7165af	9560af		1600-1700	USA, WMLK Bethel PA	9465am			
1600-1700	France, Radio France Intl	9485af	11615af	12015af	1600-1700	USA, WRNO New Orleans LA	15420am			
1600-1700 vl	Georgia, Voice of Hope	6290eu			1600-1700	USA, WSHB Cypress Crk SC	18930af			
1600-1650	Germany, Deutsche Welle	6170as	7130af	7225as	1600-1700	USA, WWCR Nashville TN	9475am	12160am	13845am	15685am
		9875as	11810af	9735af	1600-1700	USA, WYFR Okeechobee FL	11830na	15215na	15695eu	17555eu
1600-1700	Germany, Overcomer Minist	6175eu	11985eu		1600-1610 a	Vatican State, Vatican R	9875va	11640va		
1600-1700	Guam, AWR/KSDA	7455as			1600-1630	Vietnam, Voice of	9840eu	12010eu		
1600-1630	GUAM, TWR/KTWR	15105as			1600-1700	Zambia, Christian Voice	3330af	4965af		
1600-1630	Iran, VOIRI	6095as	7215as	9780as	1600-1700 vl	Zambia, R Zambia/ZNBC 1	4910do			
1600-1700 vl	Italy, RRS	3985va			1600-1700 vl	Zambia, R Zambia/ZNBC 2	6165do			
1600-1630	Jordan, Radio	11690eu			1610-1615	Bangladesh, Bangla Betar	4880do			
1600-1700	Lebanon, Voice of Hope	9960me			1610-1700	USA, WYFR Okeechobee FL	11550as			
1600-1700	Malaysia, Radio	7295do			1615-1700	UK, BBC African Service	6190af	11940af	15400af	15420af
1600-1650 occsna	New Zealand, R NZ Intl	6105pa					17830af	21470af	21660af	
1600-1700	Nigeria, Voice of	7255af	15120af		1615-1645 as	UK, BBC African Service	11860af			
1600-1630 s	Norway, Radio Norway Intl	13800va	13805na		1615-1700	UK, BBC Asian Service	3915as	5975as	7135as	9510as
1600-1630	Pakistan, Radio	7230va	9650me	11570me	1615-1700 as	UK, BBC World Service	9740as	11750as		
1600-1700 vl	Papua New Guinea, NBC	4890do			1615-1630	UK, BBC World Service	9515na			
1600-1700	Russia, Voice of Russia WS	4920eu	5940eu	5965eu	1615-1630	Vatican State, Vatican R	6010eu	9915eu		
		6175af	7115af	7125eu			4005eu	5883eu	7250eu	9645eu
		7180eu	7185af	7210af	1630-1655	Belgium, R Vlaanderen Int	5910eu	7290eu		
		7275af	7305af	7255af	1630-1659 s	Canada, R Canada Intl	9640na	11855na		
		9585me	9765eu	9880eu	1630-1700	Egypt, Radio Cairo	15255af			
		12065me	15400eu		1630-1700	Georgia, Georgian Radio	6180eu			
1600-1625	S Africa, Channel Africa	5955af			1630-1700	Slovakia, R Slovakia Intl	5915eu	6055eu	7345eu	
1600-1700 as	Sri Lanka, Sri Lanka BC	9730as	15425as		1645-1700	Tajikistan, Radio Dushanbe	7245as	11620as		
1600-1700	Swaziland, Trans World R	9500af			1650-1700	Eqt Guinea, Radio Africa	15186af			
1600-1615	Switzerland, Swiss R Intl	9575as	15265as		1650-1700 mtwhf	New Zealand, R NZ Intl	6145pa			

SELECTED PROGRAMS

Sundays

1600 Switzerland, Swiss R Intl: News. See S 0400.
 1600 UK, BBC London (af/am/as/eu): World News. See S 0100.
 1605 Switzerland, Swiss R Intl: Newsnet. See S 0405.
 1605 UK, BBC London (af/am/as/eu): Sunday Sportsworld. See S 1605.
 1605 UK, BBC London (am/as/eu): Sunday Sportsworld: The Sunday sports magazine.

Mondays

1600 Switzerland, Swiss R Intl: News. See S 0400.
 1600 UK, BBC London (af/as): World News. See S 0100.
 1600 UK, BBC London (am/eu): Europe Today. See M 0530.
 1605 Switzerland, Swiss R Intl: Newsnet. See S 0405.
 1615 UK, BBC London (af): Fast Track: The latest African sports news and action.
 1615 UK, BBC London (as): Multitrack Hit-List: The UK Top 20.
 1630 UK, BBC London (am/eu): World Business Report. See M 0905.
 1645 UK, BBC London (af): Insight: An examination of a topical aspect of the international scene.
 1645 UK, BBC London (am/as/eu): Britain Today. See S 0045.

Tuesdays

1600 Switzerland, Swiss R Intl: News. See S 0400.
 1600 UK, BBC London (af/as): World News. See S 0100.
 1600 UK, BBC London (am/eu): Europe Today. See M 0530.
 1605 Switzerland, Swiss R Intl: Newsnet. See S 0405.
 1615 UK, BBC London (af): Money Focus: African business magazine.
 1615 UK, BBC London (as): Megamix: A youth magazine series which covers new trends: entertainment, sport and other issues.
 1630 UK, BBC London (am/eu): World Business Report. See M 0905.

Wednesdays

1600 Switzerland, Swiss R Intl: News. See S 0400.
 1600 UK, BBC London (af/as): World News. See S 0100.
 1600 UK, BBC London (am/eu): Europe Today. See M 0530.
 1605 Switzerland, Swiss R Intl: Newsnet. See S 0405.
 1615 UK, BBC London (af): Talkabout Africa: Telephone conversations with BBC correspondents on late-breaking African events.
 1615 UK, BBC London (as): Multitrack X-Press: New pop records, interviews, news and competitions.
 1630 UK, BBC London (am/eu): World Business Report. See M 0905.
 1645 UK, BBC London (af): Insight. See M 1645.
 1645 UK, BBC London (am/as/eu): Britain Today. See S 0045.

Thursdays

1600 Switzerland, Swiss R Intl: News. See S 0400.
 1600 UK, BBC London (af/as): World News. See S 0100.
 1600 UK, BBC London (am/eu): Europe Today. See M 0530.
 1605 Switzerland, Swiss R Intl: Newsnet. See S 0405.
 1615 UK, BBC London (af): Art Beat. See S 0430.
 1615 UK, BBC London (as): Pop Science. See S 1730.
 1630 UK, BBC London (am/eu): World Business Report. See M 0905.
 1645 UK, BBC London (af): Insight. See M 1645.
 1645 UK, BBC London (am/as/eu): Britain Today. See S 0045.

Fridays

1600 Switzerland, Swiss R Intl: News. See S 0400.
 1600 UK, BBC London (af/as): World News. See S 0100.
 1600 UK, BBC London (am/eu): Europe Today. See M 0530.

1605 Switzerland, Swiss R Intl: Newsnet. See S 0405.

1615 UK, BBC London (af): African Perspective. See S 0630.
 1615 UK, BBC London (as): Multitrack Alternative. See F 1430.
 1630 UK, BBC London (am/eu): World Business Report. See M 0905.

1645 UK, BBC London (af): Insight. See M 1645.

1645 UK, BBC London (am/as/eu): Britain Today. See S 0045.

Hauser's Highlights

ISRAEL: ISRAEL RADIO

Z-98 in English:

UTC	kHz
0400-0415	17535, 11605, 9435
1030-1035	15650, 15640
1400-1430	17535, 15650
1545-1557	17535, 15650
1545-1600	11605
1900-1925	15650, 15640, 11605, 9435

1700 UTC

1:00 PM EDT/10:00 AM PDT

SHORTWAVE GUIDE

1800 UTC

2:00 PM EDT/11:00 AM PDT

FREQUENCIES

1700-1800	Anguilla, Caribbean Beacon	11775am		1800-1900	Anguilla, Caribbean Beacon	11775am	
1700-1800	Australia, Radio	5995pa	6020pa	1800-1900	Argentina, RAE	15345eu	
		9770as	11880pa	1800-1900	Australia, Radio	5995pa	
1700-1800 vl	Australia, VL8A Alice Spg	2310do		1800-1900 vl	Australia, VL8A Alice Spg	2310do	
1700-1800 vl	Australia, VL8K Katherine	2485do		1800-1900 vl	Australia, VL8K Katherine	2485do	
1700-1800 vl	Australia, VL8T Tent Crk	2325do		1800-1900	Australia, VL8T Tent Crk	2325do	
1700-1800 vl	Canada, CBC N Quebec Svc	9625do		1800-1900	Azerbaijan, Radio Baku	6110as	
1700-1800	Canada, CFRX Toronto	6070do		1800-1900	Bangladesh, Bangla Betar	7190eu	9570as
1700-1800	Canada, CFVP Calgary	6030do		1800-1900	Brazil, Radio Bras	15265eu	15520do
1700-1800	Canada, CHNX Halifax	6130do		1800-1900	Canada, CFRX Toronto	6070do	
1700-1800	Canada, CKZN St John's	6160do		1800-1900	Canada, CFVP Calgary	6030do	
1700-1800	Canada, CKZU Vancouver	6160do		1800-1900	Canada, CHNX Halifax	6130do	
1700-1800	China, China Radio Intl	5220af	7150af	1800-1900	Canada, CKZN St John's	6160do	
		9570af	9700af	1800-1900	Canada, CKZU Vancouver	6160do	
1700-1800	Costa Rica, RF Peace Intl	15050am		1800-1900	Costa Rica, RF Peace Intl	15050am	
1700-1727	Czech Rep, Radio Prague	5930eu	9430af	1800-1827	Czech Rep, Radio Prague	5930eu	9430as
1700-1800	Egypt, Radio Cairo	15255af		1800-1830	Egypt, Radio Cairo	15255af	
1700-1800	Eqt Guinea, Radio Africa	15186af		1800-1900	Eqt Guinea, Radio Africa	15186af	
1700-1730	France, Radio France Intl	9485af	11615af	1800-1900 vl	Georgia, Voice of Hope	6290eu	
1700-1800 vl	Georgia, Voice of Hope	6290eu		1800-1830 s	Germany, Universal Life	11605af	
1700-1800	Germany, Overcomer Ministr	6175eu	11985eu	1800-1815	Greece, Voice of	7450eu	9420eu
1700-1800 vl	Italy, IRRS	3985va				11770sa	11730na
1700-1800	Japan, R Japan/NHK World	6090as	7110eu	1800-1900	India, All India Radio	7410eu	9950eu
		9535na	9825as	1800-1900		13770af	11620eu
		15355af		1800-1900 vl	Italy, IRRS	3985va	
1700-1800	Lebanon, Voice of Hope	9960me		1800-1900 vl	Kenya, Kenya Broadc Corp	4885do	
1700-1800	Liberia, Star Radio	5880do		1800-1900	Kuwait, Radio	11990na	
1700-1800	Malaysia, Radio	7295do		1800-1900	Lebanon, Voice of Hope	9960me	
1700-1800 mtwhf	New Zealand, R NZ Intl	6145pa		1800-1900	Liberia, Star Radio	5880do	
1700-1730 s	Norway, Radio Norway Intl	7560eu		1800-1900	Malaysia, Radio	7295do	
1700-1715 vl	Palau, KHBN/Voice of Hope	9965as		1800-1900 s	Morocco, RTVM Marocaine	17815af	
1700-1800 vl	Papua New Guinea, NBC	4890do		1800-1830	Netherlands, Radio	6020af	7120af
1700-1800	Poland, Polish R Warsaw	6000eu	6095eu	1800-1851 mtwhf	New Zealand, R NZ Intl	6145pa	11655af
1700-1756	Romania, R Romania Intl	7195eu	9690eu	1800-1900	North Korea, R Pyongyang	6575eu	9345eu
1700-1800	Russia, Voice of Russia WS	6130eu	7115af	1800-1900 vl	Papua New Guinea, NBC	4890do	11700na
		7210va	7275af	1800-1900	Philippines, R Pilipinas	11730me	13760na
		9890eu		1800-1900	Russia, Voice of Russia WS	4920eu	6130eu
1700-1730	S Africa, Channel Africa	15240af		1800-1851	7180eu	7210af	
1700-1800	Swaziland, Trans World R	9500af		1800-1900	7275af	7305af	
1700-1800	UK, BBC African Service	6005af	6190af	1800-1830	7404eu	7490af	
		15400af	15420af	1800-1900	S Africa, Channel Africa	15240af	
1700-1745	UK, BBC Asian Service	3915as	5975as	1800-1900	South Korea, R Korea Intl	5975as	
		9740as	11750as	1800-1900	Sudan, Radio Omdurman	9200af	
1700-1800	UK, BBC World Service	3955eu	6095me	1800-1830	Swaziland, Trans World R	3200af	
		7210eu	9410eu	1800-1900	Swaziland, Trans World R	9500af	
		15485eu	17840na	1800-1900	UK, BBC African Service	3255af	9630af
		13815am		1800-1830	UK, BBC Asian Service	6005af	
1700-1800	USA, KAIJ Dallas TX	15385am		1800-1815	UK, BBC Asian Service	15420af	
1700-1800	USA, KJES Mesquite NM	15590am		1800-1900	UK, BBC World Service	17830af	
1700-1800	USA, KTBN Salt Lk City UT	7560pa	9930as	1800-1900	USA, KJES Mesquite NM	5975as	
1700-1800	USA, KWHR Naaehu HI	9930as		1800-1900	USA, KTBN Salt Lk City UT	6065as	
1700-1800	USA, Voice of America	5955as	6040af	1800-1900	USA, KWHR Naaehu HI	15385am	
		7215as	9645as	1800-1900	USA, KWHR Naaehu HI	15590am	
		12040af	15120eu	1800-1900	USA, Voice of America	7560pa	
1700-1800 mtwhf	USA, Voice of America	5990as	6045as	1800-1900	USA, Voice of America	13625as	11920af
		9795as	11955as	1800-1900	USA, Voice of America	6035af	15580af
		15255as		1800-1900	USA, Voice of America	11975af	
1700-1800	USA, WEWN Birmingham AL	11875na	13615na	17695eu	USA, WEWN Birmingham AL	11875na	
1700-1800	USA, WGTG McCaysville GA	9400am		1800-1900	USA, WGTG McCaysville GA	9400am	
1700-1800	USA, WHRI Noblesville IN	13760am	15105am	1800-1900	USA, WHRA Greenbush ME	17655af	
1700-1800	USA, WINB Red Lion PA	13790af		1800-1900	USA, WHRI Noblesville IN	9495am	13760am
1700-1800	USA, WJCR Upton KY	7490na		1800-1900	USA, WINB Red Lion PA	13790af	
1700-1800	USA, WMLK Bethel PA	9465am		1800-1900	USA, WJCR Upton KY	7490na	
1700-1800	USA, WRNO New Orleans LA	15420am		1800-1859	USA, WRNO New Orleans LA	9955am	
1700-1759 tha	USA, WSHB Cypress Crk SC	18930af		1800-1859	USA, WSHB Cypress Crk SC	15665eu	
1700-1800	USA, WWCR Nashville TN	9475am	12160am	1800-1859 s	USA, WSHB Cypress Crk SC	18930af	
1700-1800	USA, WYFR Okeechobee FL	11550as	15695eu	1800-1859 sw	USA, WWCR Nashville TN	9475am	15685am
1700-1800	Zambia, Christian Voice	3330af	4965af	1800-1900	USA, WYFR Okeechobee FL	17555eu	
1700-1800 vl	Zambia, R Zambia/ZNBC 1	4910do		1800-1930	Vietnam, Voice of	9780do	
1700-1800 vl	Zambia, R Zambia/ZNBC 2	6165do		1800-1900	Yemen, Radio Aden	9780do	
1700-1800 vl	Zimbabwe, Zimbabwe BC	4828do		1800-1900	Zambia, Christian Voice	3330af	
1715-1745 vl	Palau, KHBN/Voice of Hope	9965as		1800-1900 vl	Zambia, R Zambia/ZNBC 1	4965af	
1715-1800 s	USA, WRMI/R Miami Intl	9955am		1800-1900 vl	Zambia, R Zambia/ZNBC 2	6165do	
1730-1755	Austria, R Austria Intl	6155eu	9655me	1800-1900 vl	Zimbabwe, Zimbabwe BC	4828do	
1730-1755	Belgium, R Vlaanderen Int	11810me	17655af	1805-1830	Malawi, MBC	5993do	
1730-1800	Guam, AWR/KSDA	7510as		1830-1900	Georgia, Georgian Radio	6230eu	
1730-1800	Netherlands, Radio	6020af	7120af	1830-1900 s	Germany, Universal Life	9490af	
1730-1800	Philippines, R Pilipinas	11730me	11890me	1830-1900	Liberia, Radio Veritas	3450do	
1730-1745 mtwhf	Swaziland, Trans World R	3200af		1830-1900	Netherlands, Radio	6020af	
1730-1800 s	Sweden, Radio	13855va	15735va	1830-1900 w	USA, FEBC/KFBS	9465as	
1730-1800 mtwhf	Sweden, Radio	6065va	15735va	1830-1900 a	Serbia, Radio Yugoslavia	6100eu	
1730-1745	UK, BBC African Service	3390af	6070af	1830-1900	Slovakia, R Slovakia Intl	5915eu	
1730-1800	Vatican State, Vatican R	11625af	13765af	1830-1835	Somalia, Radio Mogadishu	6732do	
1745-1800	Bangladesh, Bangla Betar	7190as	9570eu	1830-1900	Turkey, Voice of	5960eu	
1745-1800	India, All India Radio	7410eu	9650af	1830-1900	UK, BBC Asian Service	9740pa	
		11935af	13780af	1830-1845 m w	UK, BBC World Service	6050eu	
1745-1800	Palau, KHBN/Voice of Hope	9965as		1830-1900 as	USA, Voice of America	7325eu	
1745-1800	Swaziland, Trans World R	3200af		1840-1850	Greece, Voice of	7150af	
1745-1800	UK, BBC Asian Service	5975as	9510as	1845-1900 irreg s	Mali, RDTV Malienne	9845af	
		9740as	11750as	1852-1900	New Zealand, R NZ Intl	15150af	
						4783do	5995do

FREQUENCIES

1900-2000	Anguilla,Caribbean Beacon	11775am		2000-2100	Algeria, R Algiers Intl	15160af	
1900-2000	Australia, Radio	5995pa	6080pa	2000-2100	Anguilla,Caribbean Beacon	11775am	
		9770pa	11880pa	2000-2100	Australia, Radio	5995pa	
1900-2000 vl	Australia, VL8A Alice Spg	2310do		2000-2100 vl	Australia, VL8A Alice Spg	12080as	
1900-2000 vl	Australia, VL8K Katherine	2485do		2000-2100 vl	Australia, VL8K Katherine	2310do	
1900-2000 vl	Australia, VL8T Tent Crk	2325do		2000-2100 vl	Australia, VL8T Tent Crk	2485do	
1900-1920	Brazil, Radio Bras	15265eu		2000-2100	Canada, CFRX Toronto	2325do	
1900-2000	Bulgaria, Radio	9700eu	11720eu	2000-2100	Canada, CFVP Calgary	6070do	
1900-2000	Canada, CFRX Toronto	6070do		2000-2100	Canada, CHNX Halifax	6030do	
1900-2000	Canada, CFVP Calgary	6030do		2000-2100	Canada, CKZN St John's	6130do	
1900-2000	Canada, CHNX Halifax	6130do		2000-2100	Canada, CKZU Vancouver	6160do	
1900-2000	Canada, CKZN St John's	6160do		2000-2100	China, China Radio Intl	6160do	
1900-2000	Canada, CKZU Vancouver	6160do		2000-2100	China, China Radio Intl	5220af	
1900-2000	China, China Radio Intl	6955af	9440af	9870af		6950eu	
1900-2000	Costa Rica,RF Peace Intl	15050am		2000-2100	Costa Rica,RF Peace Intl	7175af	
1900-2000	Ecuador, HCJB	12015eu	21455am	2000-2100	Ecuador, HCJB	9920eu	
1900-2000	Eqt Guinea, Radio Africa	15186af		2000-2100	Eqt Guinea, Radio Africa	15050am	
1900-2000 vl	Georgia, Voice of Hope	6290eu		2000-2030	Finland/YLE/R Finland	21455am	
1900-1950	Germany, Deutsche Welle	9640af	9670af	11785af	Georgia, Voice of Hope	6135af	
		13790af	15390af	11810af	Germany, Deutsche Welle	6285eu	
1900-2000	Guatemala, Adv World R	5980am		2000-2100 vl	Ghana, Ghana Broadc Corp	9615eu	
1900-1930	Hungary, Radio Budapest	3975eu	7170eu	2000-2030	Greece, Voice of	3366do	
1900-1945	India, All India Radio	7410eu	9650af	11620eu	Guatemala, Adv World R	7430eu	
		11935af	13780af	15075af	Greece, Voice of	9380eu	
1900-1925	Israel, Kol Israel	9435va	11605va	15640af	Indonesia, Voice of	5980am	
1900-2000 vl	Italy, IRRS	3985va		2000-2030	Iran, VOIRI	15150as	
1900-2000 vl	Kenya, Kenya Broadc Corp	4885do	4935do	6150do	Italy, IRRS	7160eu	
1900-2000	Kuwait, Radio	11990eu		2000-2100 vl	Kenya, Kenya Broadc Corp	3955va	
1900-1930 a	Latvia, Radio	5935eu		2000-2100	Kuwait, Radio	4885do	
1900-2000	Lebanon, Voice of Hope	9960me		2000-2100	Lebanon, Voice of Hope	11990eu	
1900-2000	Liberia, Radio Veritas	3450do		2000-2100	Liberia, Radio Veritas	9960me	
1900-2000	Liberia, Star Radio	5880do		2000-2100	Liberia, Star Radio	3450do	
1900-1915	Liberia,LCN/R Liberia Int	5100do		2000-2030	Malaysia, Radio	5880do	
1900-2000	Malaysia, Radio	7295do		2000-2025	Mexico, Radio Mexico Intl	7295do	
1900-1930	Mexico, Radio Mexico Intl	9705na			Netherlands, Radio	9705na	
1900-2000	Netherlands, Radio	6020af	7120af	9895af		6020af	
		15315af	17605af	11655af		15315af	
1900-2000	Nigeria, Voice of	7255af	15120af		2000-2051 smtwh	New Zealand, R NZ Intl	
1900-2000	North Korea, R Pyongyang	6570pa	9600af	9975me	2000-2100 fa	New Zealand, R NZ Intl	
1900-1930 s	Norway, Radio Norway Intl	7485eu	9590af	9960na	2000-2005	Nigeria, FRCN/Radio	
1900-2000 vl	Papua New Guinea, NBC	4890do		2000-2100	Nigeria, Voice of	3326do	
1900-1930	Philippines, R Pilipinas	11730me	11890me	15190me	2000-2030 s	Norway, Radio Norway Intl	
1900-2000	Russia,Voice of Russia WS	4920eu	5940eu	5965eu	2000-2100 vl	Papua New Guinea, NBC	
		7180eu	7305af	7325af	2000-2025	Poland, Polish R Warsaw	
		7490af	9440af	9585af	2000-2100	Russia,Voice of Russia WS	
		9890eu				6035eu	
1900-2000 vl	Solomon Islands, SIBC	5020do		2000-2005	S Africa, Voice of Hope	6095eu	
1900-2000 a	Sri Lanka, Sri Lanka BC	5975eu		2000-2100	Sierra Leone, SLBS	7255af	
1900-2000	Swaziland, Trans World R	3200af		2000-2015	Solomon Islands, SIBC	3200af	
1900-1930	Switzerland, Swiss R Intl	6165eu	9885eu		2000-2015 irreg	Somalia, Radio Mogadishu	
1900-2000	Thailand, Radio	9535eu	9655eu	11905eu	2000-2100	South Korea, R Korea Intl	
1900-1930	Turkey, Voice of	5960eu	9540na		2000-2030	South Korea, R Korea Intl	
1900-2000	UK, BBC African Service	3255af	6005af	6190af	2000-2100	Spain, R Exterior Espana	
		11835af	11880af	15105af	2000-2010	Swaziland, Trans World R	
		17830af	17885af		2000-2015	Switzerland, Swiss R Intl	
1900-2000	UK, BBC Asian Service	9740pa		2000-2100	Uganda, Radio	4976do	
1900-2000 s	UK, BBC Asian Service	5975me	6180eu	6195eu	2000-2100	UK, BBC African Service	3255af
1900-2000	UK, BBC World Service	3955eu		2000-2100	UK, BBC Asian Service	6005af	
		12095eu		2000-2100	UK, BBC World Service	11835af	
1900-2000	UK, BBC World Service	5975me	6150eu	7210eu	2000-2100	UK, BBC World Service	15400af
1900-2000	USA, KAIJ Dallas TX	13815am		2000-2100	USA, KAIJ Dallas TX	11780eu	
1900-1959	USA, KBHI N Mariana Is	9355eu	9385af		2000-2100	USA, KTBN Salt Lk City UT	13815am
1900-2000	USA, KTBW Salt Lk City UT	15590am		2000-2100	USA, KWHR Naalehu HI	15590am	
1900-2000	USA, KWHR Naalehu HI	13625as	17555pa		2000-2100	USA, Voice of America	15405as
1900-2000	USA, Voice of America	6035af	9525pa	9760eu	2000-2030	USA, Voice of America	6035af
		11920af	11975af	13710af	2000-2059 sw	USA, Voice of America	11975af
		15410af	15580af	15180pa	2000-2030	USA, Voice of America	4950af
1900-1930 s	USA, Voice of America	4950af		2000-2100	USA, WEWN Birmingham AL	11875na	
1900-2000	USA, WEWN Birmingham AL	11875na	13615am	17695eu	2000-2100	USA, WGTG McCaysville GA	13615na
1900-2000	USA, WGTG McCaysville GA	9400am		2000-2100	USA, WHRA Greenbush ME	12160am	
1900-2000	USA, WHRA Greenbush ME	17655af		2000-2100	USA, WHRI Noblesville IN	13845am	
1900-2000	USA, WHRI Noblesville IN	9495am	13760am	2000-2100	USA, WINB Red Lion PA	15565eu	
1900-2000	USA, WINB Red Lion PA	13790eu		2000-2100	USA, WJCR Upton KY	9400am	
1900-2000	USA, WJCR Upton KY	7490na		2000-2100	USA, WRNO New Orleans LA	13760am	
1900-1930 s	USA, WRM/R Miami Intl	9955am		2000-2100	USA, WSHB Cypress Crk SC	15405as	
1900-2000	USA, WRNO New Orleans LA	15420am		2000-2100	USA, WWCR Nashville TN	11550eu	
1900-1959 sth	USA, WSHB Cypress Crk SC	15665eu		2000-2100	USA, WYFR Okeechobee FL	12160am	
1900-2000	USA, WWCR Nashville TN	9475am	12160am	13845am	2000-2010	USA, WYFR Okeechobee FL	15665eu
1900-2000	USA, WYFR Okeechobee FL	17555pa		2000-2010	Vatican State, Vatican R	7355af	
1900-1930	Vietnam, Voice of	9840eu	12020eu	15010eu	2000-2100	Vatican State, Vatican R	5883eu
1900-2000	Zambia, Christian Voice	3330af	4965af		2000-2100	Zambia, Christian Voice	4965af
1900-2000 vl	Zambia, R Zambia/ZNBC 1	4910do		2000-2100	Zambia, R Zambia/ZNBC 2	11625af	
1900-2000 vl	Zambia, R Zambia/ZNBC 2	6165do		2005-2100	Zimbabwe, Zimbabwe BC	17695eu	
1900-2000 t	Zimbabwe, Zimbabwe BC	4828do		2005-2030	USA, Voice of America	11625af	
1930-2000 t	Belarus, R Belarus Intl	7105eu	7210eu	13715eu	2005-2030	USA, Voice of America	17695eu
1930-2000	Georgia, Georgian Radio	6230eu		2025-2045	Namibia, NBC	11625af	
1930-2000	Iran, VOIRI	7160eu	7260eu	13715eu	2025-2045	Italy, RAI Intl	11625af
1930-2000	Mongolia, Voice of	9720eu	12085eu	13715eu	2030-2100 th	Belarus, R Belarus Intl	11625af
1930-2000	Poland, Polish R Warsaw	6035eu	6095eu	9022eu	2030-2100	Cuba, Radio Havana	11625af
1930-2000 mwtwha	Sweden, Radio	6065eu		2030-2100	Egypt, Radio Cairo	11625af	
1930-2000	Uganda, Radio	4976af		2030-2035 mtwhf	Germany,Adventist World R	11625af	
1930-2000	USA, Voice of America	4950af		2030-2100	Latvia, Radio	9835af	
1935-1955	Italy, RAI Intl	6015eu	7225eu	9022eu	2030-2100 as	Malta, VO Mediterranean	5935eu
1940-2000 vl	Antarctica, LRA36 R Nac	15476do		2030-2100	Sweden, Radio	6065eu	
1945-2000	Albania, R Tirana Intl	6025eu	7135eu		2030-2100	Thailand, Radio	13830eu
1950-2000	Vatican State, Vatican R	4005eu	5883eu	922eu	2030-2100 as	Turkey, Voice of	9655eu
1956-2000	S Africa, Voice of Hope	6290af		2030-2100	USA, Voice of America	11905eu	
				2030-2100	Uzbekistan, R Tashkent	9840eu	
				2030-2100	Vietnam, Voice of	10200eu	
				2045-2100 t	Germany, Universal Life	15010eu	
				2045-2100	India, All India Radio	11620eu	
				2052-2100 smtwh	New Zealand, R NZ Intl	7410eu	
						9910au	
						9950eu	

2100 UTC

5:00 PM EDT/2:00 PM PDT

SHORTWAVE GUIDE

2200 UTC

6:00 PM EDT/3:00 PM PDT

FREQUENCIES

2100-2200	Anguilla, Caribbean Beacon	11775am				
2100-2130	Australia, Radio	5995pa	7240pa	9500as	9660pa	
2100-2130 vl	Australia, VL8A Alice Spg	9770as	11880pa	12080pa	17795pa	
2100-2130 vl	Australia, VL8K Katherine	2310do				
2100-2200 vl	Australia, VL8K Katherine	2485do				
2100-2130 vl	Australia, VL8T Katherine	5025do				
2100-2200 vl	Australia, VL8T Tent Crk	2325do				
2100-2200 vl	Australia, VL8T Tent Crk	4910do				
2100-2200	Bulgaria, Radio	9700eu	11720eu			
2100-2115 vl	Cameroon, Radio Cameroon	4850do				
2100-2200 vl	Cameroon, Radio Garoua	5010do				
2100-2200 vl	Canada, CBC N Quebec Svc	9625do				
2100-2200	Canada, CFRX Toronto	6070do				
2100-2200	Canada, CFVP Calgary	6030do				
2100-2200	Canada, CHNX Halifax	6130do				
2100-2200	Canada, CKZN St John's	6160do				
2100-2200	Canada, CKZU Vancouver	6160do				
2100-2200	Canada, R Canada Intl	5925va	5995va	7235va	9805va	
		11945va	13650va	13690va	15150va	
2100-2130	China, China Radio Intl	5220va	6950eu	7170af	7180af	
		9535af	9670va	9920eu	9920eu	
2100-2200	China, China Radio Intl	6950eu	9635eu	9920eu		
2100-2200	Costa Rica, RF Peace Intl	15050am				
2100-2130	Cuba, Radio Havana	13605eu	13615eu	13715eu		
2100-2127	Czech Rep, Radio Prague	5930na	7345af			
2100-2200	Ecuador, HCJB	12015eu	21455am			
2100-2200	Egypt, Radio Cairo	15375af				
2100-2200	Eqt Guinea, Radio Africa	15186af				
2100-2150	Germany, Deutsche Welle	7115as	9670as	9735af	9765as	
		11785as	11865af	15135va		
2100-2115 t	Germany, Universal Life	5890eu				
2100-2130	Germany, Adventist World R	9835af				
2100-2130	Hungary, Radio Budapest	3975eu	11700eu			
2100-2200	India, All India Radio	7150au	7410eu	9910au	9950eu	
		11620eu	11715au			
2100-2200	Japan, R Japan/NHK World	6035pa	9725eu	11850pa	13630na	
2100-2107 vl	Kenya, Kenya Broadc Corp	4885do	4935do	6150do		
2100-2200	Liberia, Radio Veritas	3450do				
2100-2115	Liberia, LCN/R Liberia Int	5100do				
2100-2200	Malaysia, Radio	7295do				
2100-2107	Namibia, NBC	3270do	3290do			
2100-2200 smtwh	New Zealand, R NZ Intl	17675pa				
2100-2106 fa	New Zealand, R NZ Intl	11735pa				
2100-2200	Nigeria, FRCN/Radio	3326do	4770do	4990do		
2100-2200	North Korea, R Pyongyang	6575eu	9345eu	11700na	13760na	
2100-2200 vl	Papua New Guinea, NBC	4890do				
2100-2156	Romania, R Romania Intl	5955eu	5990eu	6175eu	7195eu	
2100-2130	Serbia, Radio Yugoslavia	6100eu	6185eu			
2100-2200 vl	Solomon Islands, SIBC	5020do				
2100-2130	South Korea, R Korea Intl	3970eu				
2100-2130	Switzerland, Swiss R Intl	3985eu				
2100-2200	Syria, Radio Damascus	9950na	12085na	13610na		
2100-2130	Turkey, Voice of	7200eu				
2100-2110	Uganda, Radio	4976do				
2100-2200	UK, BBC African Service	6005af	6190af	11835af		
2100-2200	UK, BBC Asian Service	3915as	5965as	5975pa	6120as	
2100-2200	UK, BBC World Service	3955eu	5975am	6180eu	6195eu	
		7325eu	9410eu	11750sa		
2100-2200	Ukraine, R Ukraine Intl	5905eu	5940eu	6010eu	6020eu	
		6080eu	7205eu	7420eu		
2100-2200	USA, KAIJ Dallas TX	13815am				
2100-2200	USA, KTBN Salt Lk City UT	15590am				
2100-2200	USA, KWHR Naaehu HI	15405as	17555pa			
2100-2200	USA, Voice of America	6035af	6070me	6095eu	7415af	
		9595af	9760eu	11870pa	11975af	
		13710af	15185as	15205as	15410af	
2100-2200	USA, WEWN Birmingham AL	5825eu	13615na			
2100-2200	USA, WGTG McCaysville GA	9400am				
2100-2200	USA, WHRA Greenbush ME	15460af				
2100-2200	USA, WHRI Noblesville IN	9495am	13760am			
2100-2200	USA, WINB Red Lion PA	11950ca				
2100-2200	USA, WJCR Upton KY	7490na				
2100-2130 s	USA, WRMI/R Miami Intl	9955am				
2100-2200	USA, WRNO New Orleans LA	15420am				
2100-2159 s	USA, WSHB Cypress Crk SC	11550eu				
2100-2159 smwa	USA, WSHB Cypress Crk SC	13770eu				
2100-2200	USA, WVCR Nashville TN	5070am	9475am	13845am		
2100-2200	USA, WYFR Okeechobee FL	7355eu	11580af	15565eu		
2100-2200	Zambia, Christian Voice	3330af	4965af			
2100-2200 vl	Zambia, R Zambia/ZNBC 1	4910do				
2100-2200 vl	Zambia, R Zambia/ZNBC 2	6165do				
2100-2200 vl	Zimbabwe, Zimbabwe BC	4828do				
2107-2200 fa	New Zealand, R NZ Intl	17675pa				
2115-2145 mthwfa	Armenia, Voice of	4810eu	9965eu			
2115-2200	Egypt, Radio Cairo	9900eu				
2115-2130 mthwfa	UK, BBC Caribbean Report	5975ca	15390ca	17715ca		
2115-2130 as	UK, BBC World Service	5975am				
2130-2200	Australia, Radio	7240pa	9500as	9660pa	12080pa	
		13755pa	17795pa			

M7

2200 UTC

2130-2200	China, China Radio Intl	5220va	6950eu	9670va	9920eu	
2130-2200	Ghana, Ghana Broad Corp	3366do				
2130-2200	Guam, AWR/KSDA	9495as				
2130-2200	Iran, VOIRI	6165pa	6175pa			
2130-2145	Iraq, Radio Iraq Intl	11785eu				
2130-2200	Malawi, MBC	3380do				
2130-2200 as	Sweden, Radio	6065eu	9430eu			
2130-2145 t f	UK, BBC Calling Falklands	11680sa				
2130-2200	UK, BBC World Service	5875eu	6050eu	9850eu		
2130-2200	Uzbekistan, R Tashkent	7105as	9540as			
2200-2300	Albania, R Tirana Intl	6025eu	7135eu			
2200-2300	Anguilla, Caribbean Beacon	6090am				
2200-2215 mthwfa	Armenia, Voice of	4810eu	9965eu			
2200-2300	Australia, Radio	9660pa	13755pa	15510pa	17795pa	
2200-2300 vl	Australia, VL8K Katherine	5025do				
2200-2300 vl	Australia, VL8T Tent Crk	4910do				
2200-2300	Canada, CBC N Quebec Svc	9625do				
2200-2300	Canada, CFRX Toronto	6070do				
2200-2300	Canada, CFVP Calgary	6030do				
2200-2300	Canada, CHNX Halifax	6130do				
2200-2300	Canada, CKZN St John's	6160do				
2200-2300	Canada, CKZU Vancouver	6160do				
2200-2229	Canada, R Canada Intl	5995va	7235va	9735va	9805va	
		11705as	11945va	13690va	15150va	
2200-2300	China, China Radio Intl	710eu				
2200-2300	China, China Radio Intl	3985eu				
2200-2300	Costa Rica, RF Peace Intl	7385am	15050am			
2200-2245	Egypt, Radio Cairo	9900eu				
2200-2300	Eqt Guinea, Radio Africa	15186af				
2200-2215	Ghana, Ghana Broad Corp	4915do				
2200-2300	India, All India Radio	7150au	7410eu	9910au	9950eu	
		11620eu	11715au			
2200-2300	Iran, VOIRI	6165pa	6175pa			
2200-2225	Italy, RAI Intl	6150pa	9675pa	11900as		
2200-2300	Liberia, LCN/R Liberia Int	5100do				
2200-2300	Malaysia, Radio	7295do				
2200-2225	Moldova, R Moldova Intl	7520eu				
2200-2300	New Zealand, R NZ Intl	17675pa				
2200-2215	Nigeria, FRCN/Radio	3326do	4770do	4990do		
2200-2230 s	Norway, Radio Norway Intl	7570sa				
2200-2300	Papua New Guinea, NBC	9675do				
2200-2300	Sierra Leone, SLBS	3316do				
2200-2300	Solomon Islands, SIBC	5020do				
2200-2300	Spain, R Exterior Espana	6125eu	11775af			
2200-2300	Syria, Radio Damascus	9950eu	12085na	13610na		
2200-2300	Taiwan, Radio Taipei Intl	5810eu	9985eu			
2200-2300	Turkey, Voice of	6135eu	7300na			
2200-2300	UK, BBC African Service	11835af				
2200-2300	UK, BBC Asian Service	5905as	5965as	6195as	7110as	
		11955as				
2200-2300	UK, BBC World Service	3955eu	5975am	6110am	6175na	
		7325eu	9410eu	9560am	9590na	
		9660as	9825am	9915sa	11750sa	
		11765am	12080pa			
2200-2300	USA, KAIJ Dallas TX	13815am				
2200-2300	USA, KTBN Salt Lk City UT	15590am				
2200-2300	USA, KWHR Naaehu HI	17510as	17555pa			
2200-2300	USA, Voice of America	7215as	9770as	9890as	11760as	
		15185as	15290as	15305as	17735as	
2200-2230 mthwfa	USA, Voice of America	6035af	7415af	11975af	12080af	
2200-2300	USA, WEWN Birmingham AL	5825eu	13615na			
2200-2300	USA, WGTG McCaysville GA	9400am				
2200-2300	USA, WHRA Greenbush ME	15460af				
2200-2300	USA, WHRI Noblesville IN	5745am	9495am			
2200-2300	USA, WINB Red Lion PA	11950ca				
2200-2300	USA, WJCR Upton KY	7490na				
2200-2300 a	USA, WRMI/R Miami Intl	9955am				
2200-2300	USA, WRMO New Orleans LA	7355na				
2200-2259 sh	USA, WSHB Cypress Crk SC	7510eu				
2200-2259 sw	USA, WSHB Cypress Crk SC	13770sa				
2200-2300	USA, WWCR Nashville TN	5070am	7435am	9475am	13845am	
2200-2300	USA, WYFR Okeechobee FL	11580af	11855ca	15565eu		
2200-2300 v	Zambia, R Zambia/ZNBC 1	4910do				
2200-2210 v	Zambia, R Zambia/ZNBC 2	6165do				
2200-2210 v	Zambia, R Zambia/ZNBC 2	4965af				
2200-2255	Austria, R Austria Intl	5945eu	6155eu	13730af		
2200-2300	Cuba, Radio Havana	6000na				
2200-2257	Czech Rep, Radio Prague	5930na	7345na			
2200-2250	Greece, Voice of	7480au	9425au			
2245-2300	Ghana, Ghana Broad Corp	3366do	4915do			
2245-2300	India, All India Radio	7410as	9705as	9950as	11620as	
2245-2300	USA, WRMI/R Miami Intl	9955am				
2245-2300	Vatican State, Vatican R	6160au	7305au	9600au	11830au	

FREQUENCIES

2300-0000	Anguilla, Caribbean Beacon	6090am				2300-0000	UK, BBC Asian Service	3915as	5965as	6035as	6195as
2300-0000	Australia, Radio	9660pa	12080pa	13755pa	15510pa	2300-0000	UK, BBC World Service	7110as	9580as	11945as	11955as
2300-0000 vi	Australia, VL8K Katherine	17795pa				2300-0000	UK, BBC World Service	3955eu	5875am	5975am	6110am
2300-0000 vi	Australia, VL8T Tent Crk	5025do				2300-0000	USA, KAIJ Dallas TX	6175na	6195eu	9590na	9825am
2300-0000	Bulgaria, Radio	4910do				2300-0000	USA, KTBN Salt Lk City UT	9915sa	11750sa	11765am	15390sa
2300-0000	Canada, CBC N Quebec Svc	9485na	11720na			2300-0000	USA, KWHR Naalehu HI	5810am			
2300-0000	Canada, CFRX Toronto	9625do				2300-0000	USA, Voice of America	7510as	17555pa		
2300-0000	Canada, CFVP Calgary	6070do				2300-0000	USA, WENW Birmingham AL	7215as	9770as	9890as	11760as
2300-0000	Canada, CHNX Halifax	6030do				2300-0000	USA, WGTG McCaysville GA	15185as	15290as	15305as	17735as
2300-0000	Canada, CKZN St. John's	6130do				2300-0000	USA, WHRA Greenbush ME	17820as			
2300-0000	Canada, CKZU Vancouver	6160do				2300-0000	USA, WHRI Noblesville IN	5825eu			
2300-2330	Canada, R Canada Intl	5960am	6040ca	9535ca	9755am	2300-0000	USA, WIND Red Lion PA	5085am			
2300-0000	Costa Rica, RF Peace Intl	11865ca				2300-0000	USA, WJCR Upton KY	11950am			
2300-2330	Cuba, Radio Havana	5030am	6150am	9725am	13750am	2300-0000	USA, WRM/R Miami Intl	7490na			
2300-0000	Egypt, Radio Cairo	15460am				2300-0000 a	USA, WRNO New Orleans LA	9955am			
2300-2350	Germany, Deutsche Welle	9900na				2300-0000	USA, WSHB Cypress Crk SC	7355am			
2300-2350	Guam, AWR/KSDA	5975as	6090as	7235as	9690as	2300-0000	USA, WSHB Cypress Crk SC	7510eu			
2300-0000	India, All India Radio	11775as				2300-0000	USA, WSHB Cypress Crk SC	13770am			
2300-2315	Iliberia, LCN/L Liberia, Int	7410as	9705as	9950as	11620as	2300-0000	USA, WWCR Nashville TN	5070am	7435am	9475am	13845am
2300-0000	Malaysia, Radio	5100do				2300-0000	Vatican State, Vatican R	7305au	9600au	11830au	
2300-2325	Moldova, R Moldova Intl	7295do				2300-0000	Canada, R Canada Intl	6040am	9535am	11865am	
2300-0000	New Zealand, R NZ Intl	7520eu				2300-0000	Ghana, Ghana Broad Corp	4915af			
2300-2315	Nigeria, FRCN/Radio	17675pa				2300-0000	Guam, AWR/KSDA	11775as			
2300-2357	North Korea, R Pyongyang	3326do	4770do	4990do		2300-0000	Lithuania, Radio Vilnius	5880na	5905na		
2300-0000 vi	Papua New Guinea, NBC	11335na	1170na	13760na	15130na	2300-0000	Netherlands, Radio	6020na	6165na	9845na	
2300-2356	Romania, R Romania Intl	9675do				2300-0000	Vietnam, Voice of	9840eu	12020eu	15010eu	
2300-0000	Singapore, SBC Radio One	5955eu	7195eu	9570na	11830na	2335-2345	Greece, Voice of	9395sa	9425sa	9935sa	11595sa
2300-0000	Singapore, R Singapore Int	6160do				2335-2345	Sierra Leone, SLBS	3316do			
2300-0000 vi	Solomon Islands, SIBC	6155as				2345-0000	UK, BBC Asian Service	3915as			
		5020do									

SELECTED PROGRAMS

Sundays

2300 UK, BBC London (am/eu): World News. See S 0100.
 2300 UK, BBC London (as): East Asia Today. News, analysis, press reviews and reports from BBC correspondents.
 2305 UK, BBC London (am/eu): Science View. See S 0040.
 2310 UK, BBC London (am/eu): Performance. See S 2230.
 2325 UK, BBC London (am/eu): Pop Short. A five-minute popular music program.
 2330 UK, BBC London (am/eu): In Praise of God. See S 0230.
 2330 UK, BBC London (as): Anything Goes. See S 1130.

Mondays

2300 UK, BBC London (am/eu): World News. See S 0100.

HAUSER'S HIGHLIGHTS

SWEDEN: R. SWEDEN

Z-98 in English on SW to N. America

		kHz	UTC
1130		15240,	
		17870	
1330		15240	
0230		9495 or	
		7135	
0330		9475 or	
		11665	
To As/Au			
1230		13740,	
		15240	
1330		13740 or	
		17515	
0100		11985	
To Eu/Af/ME			
1730	Sun	13855,	
		15735 and	

Mon-Sat 6065, 15735

1930 6065

2030 Sat & Sun 6065, 13830

2130 6065, 9430

(via Andreas Volk, BC-DX)

New URL is <http://www.radiosweden.com>

(MediaScan)

2300 UK, BBC London (as): East Asia Today. See S 2300.
 2305 UK, BBC London (am/eu): Outlook. See M 1405.
 2330 UK, BBC London (am/eu): Multitrack Hit-List. See M 1615.
 2330 UK, BBC London (as): Insight. See M 1645.
 2345 UK, BBC London (as): Seven Days. See M 0615.

Tuesdays

2300 UK, BBC London (am/eu): World News. See S 0100.
 2300 UK, BBC London (as): East Asia Today. See S 2300.
 2305 UK, BBC London (am/eu): Outlook. See M 1405.
 2330 UK, BBC London (am/eu): Megamix. See T 1615.
 2345 UK, BBC London (as): Insight. See M 1645.

Wednesdays

2300 UK, BBC London (am/eu): World News. See S 0100.
 2300 UK, BBC London (as): East Asia Today. See S 2300.
 2305 UK, BBC London (am/eu): Outlook. See M 1405.
 2330 UK, BBC London (am/eu): Multitrack X-Press. See W 1615.
 2330 UK, BBC London (as): Insight. See M 1645.

Thursdays

2300 UK, BBC London (am/eu): World News. See S 0100.
 2300 UK, BBC London (as): East Asia Today. See S 2300.
 2305 UK, BBC London (am/eu): Outlook. See M 1405.
 2330 UK, BBC London (am/eu): John Peel. See M 1130.
 2330 UK, BBC London (as): Insight. See M 1645.

Fridays

2300 UK, BBC London (am/eu): World News. See S 0100.
 2300 UK, BBC London (as): World News. See S 0100.
 2305 UK, BBC London (am/eu): Outlook. See M 1405.
 2305 UK, BBC London (as): Spotlight. See F 1555.
 2310 UK, BBC London (as): Variable Feature. See S 0130.
 2325 UK, BBC London (as): Pop Short. See S 2325.
 2330 UK, BBC London (am/eu): Multitrack Alternative. See F 1430.
 2330 UK, BBC London (as): Insight. See M 1645.
 2345 UK, BBC London (as): Record News. See S 0815.

Saturdays

2300 UK, BBC London (am/eu): Play of the Week (from 2230). See S 1130.
 2300 UK, BBC London (as): News Summary. See S 1100.
 2301 UK, BBC London (as): From Our Own Correspondent. See S 0330.
 2330 UK, BBC London (am/eu): Andy Kershaw's World of Music. See M 1830.
 2330 UK, BBC London (as): Science in Action. See M 0930.

HAUSER'S HIGHLIGHTS

ICELAND: ICELAND RADIO

Z-98 assignments for, 10 kW are:

kHz	UTC
7560	1845-1930
9310	1845-2015
9360	1200-1300
	1400-1445
	2300-2345
11575	1200-1300
	1400-1445
	1930-2015
	2300-2345
13805	1930-2050
13815	1200-1300
13830	2300-2345
13860	1400-1445
15640	1200-1300
(HFCC via Bob Padula, EDXP)	
That's official, but this station has a track record of not adhering to it (gh)	

HAUSER'S HIGHLIGHTS

JAPAN: NHK

Z-98 relays via Canada

English to NAm

UTC	kHz
0500-0600	6110
1100-1200	6120 (new)
0000-0100	11705
Direct from Yamata to NAm:	
0300-0400	17825
0500-0700	9835
1400-1500	9505
1700-1800	9535
2100-2200	13630
(NHK via Kunitoshi Hishikawa via Karl Leite, radioescutas)	



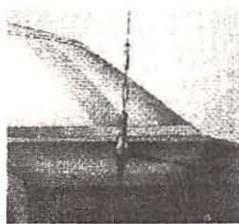
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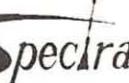
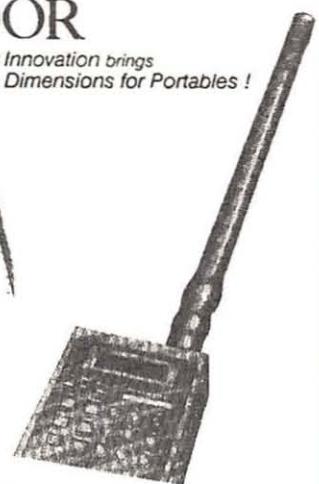
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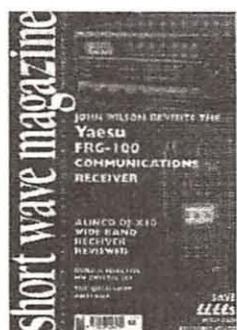


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Carrier Broadcasting

In the article "The Ultimate Longwave Receiving Setup" (MT Dec '97), I alluded to a mode of propagation that is not well known today: carrier current. This method of transmitting an RF signal is many decades old but has been rumored to be making a comeback in North America for certain activities.

The theory is quite elementary: you simply induce a low power RF signal on an existing metallic distribution grid. For example, you induce, or couple, the low power RF AM signal from a small transmitter onto the electrical distribution system of a building, or buildings, for the purpose of broadcasting only to listeners within that discrete electrical network.

The most common use for this system today is for the distribution of a university radio program inside the perimeter of the university compound. No license is required for such an installation and the costs involved are minimal: the electrical distribution system is already in place. Most of the costs are to install RF bypass networks to avoid the impedance mismatch created by transformers and other types of coils and chokes when going from building to building.

In the effort to reach every corner of campus, very often the neighborhood is unintentionally within the broadcast area. In most cases, these low power stations will choose a split channel (for example 675 kHz) in an area of the AM band where there is very little local activity to avoid undue interference.

In order to receive the broadcast it is only necessary to plug your AC operated receiver into the electrical distribution network of the university, or if you use a battery powered receiver, you have to be located within the confine of the campus.

OPTIMUM WORKING FREQUENCIES (MHz) For the Period 15 May to 14 June 1998 Flux=120 SSN=76 Predictions prepared using ASAPS for Windows®

UTC	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
TO/FROM US WEST COAST																									
SOUTH AMERICA	20	19	19	18	16	15	15	14	14	13	11	12	13	15	16	17	18	19	20	21	21	20	21	21	
WESTERN EUROPE	14	13	12	11	11	11	12	11	10	*	*	*	*	*	12	14	16	17	17	16	16	16	16	16	15
EASTERN EUROPE (P)	14	14	14	15	15	15	14	12	*	*	*	*	*	*	13	14	15	15	16	16	16	16	15	15	14
MEDITERRANEAN	17	17	17	16	16	15	14	13	*	*	*	*	*	*	15	16	17	18	18	18	18	18	17	17	
MIDDLE EAST (P)	15	15	17	17	17	16	15	*	*	*	*	*	*	*	14	16	18	19	19	18	17	16	15	15	
CENTRAL AFRICA	17	17	14	12	10	10	13	12	*	*	*	*	*	*	16	18	19	20	21	21	19	18	18		
SOUTH AFRICA	*	11	10	9	8	8	12	13	13	13	*	*	*	*	15	16	18	19	20	19	16	*	*	*	
SOUTH EAST ASIA (P)	19	18	18	18	18	18	17	15	14	*	12	12	11	10	10	11	13	14	16	18	19	18	17	16	
FAR EAST	18	16	16	16	16	15	13	12	12	11	10	10	11	13	14	13	13	14	15	16	17	18	17		
AUSTRALIA	21	22	22	21	20	18	17	16	15	15	14	14	13	13	12	12	*	*	*	21	21	22	21		
TO/FROM US MIDWEST																									
SOUTH AMERICA	18	17	17	16	14	14	13	13	13	12	10	12	14	15	16	17	18	19	19	19	20	19	19	19	
WESTERN EUROPE	16	14	13	13	12	12	12	11	11	*	*	*	13	14	15	16	17	17	17	16	17	17	17	17	
EASTERN EUROPE	13	13	14	14	15	13	12	*	*	*	*	*	13	14	15	15	16	16	16	16	16	15	15	14	
MEDITERRANEAN	17	17	17	16	15	14	12	*	*	*	*	*	*	15	16	17	18	18	18	18	17	17	17	17	
MIDDLE EAST (P)	14	14	16	17	16	14	*	*	*	*	*	*	*	15	17	18	19	19	19	17	17	16	15	14	
CENTRAL AFRICA	18	17	14	11	10	9	13	13	*	*	*	*	*	16	18	19	20	21	21	20	19	18	18		
SOUTH AFRICA	11	11	10	9	8	8	12	13	13	*	*	*	*	15	16	18	19	20	21	19	16	*	12		
SOUTH EAST ASIA (P)	17	17	17	18	17	16	*	*	*	*	11	12	13	15	17	18	19	18	18	18	16	16	18		
FAR EAST	17	16	16	17	17	15	14	12	12	11	11	11	11	12	14	14	14	14	15	15	16	17	17		
AUSTRALIA	20	20	20	19	18	16	15	14	14	14	14	14	13	13	12	13	*	*	*	21	20	20	20		
TO/FROM US EAST COAST																									
SOUTH AMERICA	16	15	14	13	13	12	12	12	11	10	9	11	14	15	16	17	17	18	18	18	17	17	17	17	
WESTERN EUROPE	14	13	12	12	11	11	11	10	10	10	10	12	14	15	17	18	18	17	16	16	17	16	16	16	
EASTERN EUROPE	13	13	12	13	12	11	*	*	*	*	*	12	13	15	17	17	16	17	18	18	17	16	15	14	
MEDITERRANEAN	16	16	15	14	13	12	12	11	*	*	*	*	13	14	15	16	17	17	17	17	17	17	16	16	
MIDDLE EAST (P)	15	15	16	15	14	*	*	*	*	*	*	*	15	16	17	17	18	18	18	17	17	17	17	16	
CENTRAL AFRICA	18	17	15	12	10	9	14	14	13	14	15	16	18	18	19	20	20	21	20	19	19	18	18		
SOUTH AFRICA	11	11	10	9	8	8	12	14	13	13	15	16	17	19	20	21	21	21	19	16	14	13	12		
SOUTH EAST ASIA (P)	17	17	17	15	*	*	*	*	*	*	*	*	13	15	17	18	18	18	18	18	16	16	17	17	
FAR EAST	17	17	17	17	15	14	*	*	11	11	11	13	14	15	15	15	15	15	15	15	16	17	17		
AUSTRALIA	19	19	18	17	15	14	13	13	13	13	13	13	13	13	*	*	*	*	*	20	19	18	18		

*Unfavorable conditions: Search around the last listed frequency for activity.

When North America was crisscrossed by numerous landline telegraph systems (before the advent of microwave), one pair of wires was made to carry more than one message by multiplexing the messages on the same line. One method was to use a large number of low power radio frequencies on the same pair. If you used one set of frequencies from point "A" to point "B," it was possible to use a different set of frequencies for "B" to "A" and have a full duplex circuit.

Some of the largest users of carrier current in the LF part of the radio spectrum were (and in some places still are) the power production and distribution companies. Let's face it, you

already have a large metallic network covering your territory; why not use it for your internal telephone system and also for telemetry between load control centers and production units? (A person tapping such a phone line today, however, had better know what he is doing: some power lines now carry 1.3 MV. Yes, that's 1,300,000 volts!)

One problem arises in the fact that 60 Hz interference and the various induced harmonics at 120, 180 Hz, etc. do not give a quiet, quality transmission. However, the circuits are good enough for controlling purposes using radio frequencies in the 180 kHz range.

New Zealand power utilities are still using this system and it plays havoc with the LF experimenters and aficionados in that part of the world. In North America, I have heard that carrier current is coming back to life in the hydro network, but I have not been able to confirm this.

Probably one of the best series of articles on the subject of "carrier-current propagation" can be found in ARRL handbooks and QST issues of the WWII era. At a time when the hams were not allowed to operate on air, some construction projects were designed so that hams did not lose interest in building electronic circuits and continuing the experimentation for which hams have become famous.

Well, now you have in a nutshell the explanation of a "new" method of radio propagation. I have to agree that it is an unusual method, but it is still being used today after over 60 years of obscure history.

Eavesdropping on Africa; Part Two: "Into Africa"

Last month, we profiled the programming of the two African broadcasters with adequate power to project beyond continental borders. This month we look at five prominent broadcasters outside Africa with programming specifically geared to the continent. Everyone has their own interests in the area, and listeners would be wise to critically compare both external and internal broadcasters in order to assess the issues and events shaping the region.

Britain's historical relationship with Africa is centered in two regions: western and southern Africa. The most comprehensive range of programming to and about Africa on the international airwaves comes from the BBC, which devotes one of its three programming streams to Africa from 0200 to 2245 daily.

Here's a comprehensive schedule, in time order, of regular BBC programs:

0330	Sun.	<i>African Quiz</i> (monthly current events test)[1st Sun.]
0330	Sun.	<i>Postmark Africa</i> (expert answers to any question)[exc. 1st Sun.]
0330	M-F	<i>Network Africa</i> (breakfast show w/news, sport, personalities, music)
0430	Sun.	<i>The Art House</i> (the arts in Africa)
0430	M-F	<i>Network Africa</i> (breakfast show w/news, sport, personalities, music)
0431	Sat.	<i>African Quiz</i> (monthly current events test)[1st Sat.]
0431	Sat.	<i>This Week in Africa</i> (regional events review)[exc. 1st Sat.]
0530	Sun.	<i>Postmark Africa</i> (expert answers to any question)
0530	M-F	<i>Network Africa</i> (breakfast show w/news, sport, personalities, music)
0531	Sat.	<i>Talkabout Africa</i> (discussion of African events and issues)
0630	Sun.	<i>African Perspective</i> (opinion, comment and discussion)
0630	M-F	<i>Network Africa</i> (breakfast show w/news, sport, personalities, music)
0631	Sat.	<i>African Quiz</i> (monthly current events test)[1st Sat.]
0631	Sat.	<i>This Week in Africa</i> (regional events review)[exc. 1st Sat.]
1030	Sat.	<i>The Art House</i> (the arts in Africa)
1505	M-F	<i>Focus on Africa</i> (correspondents' reports from around the continent)
1615	Mon.	<i>Fast Track</i> (weekly review of African sport)
1615	Tue.	<i>Money Focus</i> (African business magazine)
1615	Wed.	<i>Talkabout Africa</i> (discussion of African events and issues)
1615	Thu.	<i>Jive Zone</i> (contemporary African music)
1615	Fri.	<i>African Perspective</i> (opinion, comment and discussion)
1705	Daily	<i>Focus on Africa</i> (correspondents' reports from around the continent)
1740	Daily	<i>African News</i>
1830	M-F	<i>Focus on Africa</i> (correspondents' reports from around the continent)
1901	Sun.	<i>Postmark Africa</i> (expert answers to any question)
1901	Mon.	<i>Fast Track</i> (weekly review of African sport)
1901	Tue.	<i>Money Focus</i> (African business magazine)
1901	Wed.	<i>Talkabout Africa</i> (discussion of African events and issues)

1901 Fri. *African Perspective* (opinion, comment and discussion)
1930 Sun. *The Art House* (the arts in Africa)

America's interests in Africa seem more sporadic and less focused, since, with the exception of Liberia, it has not had a long-term relationship with the continent. Nonetheless, to its credit, the Voice of America gives special attention to its African listeners, especially in current affairs, sport and music.

0300	M-F	<i>Daybreak Africa</i> (morning show w/news, sports reports and features)
0430	M-F	<i>Daybreak Africa</i> (morning show w/news, sports reports and features)
0600	M-F	<i>Daybreak Africa</i> (morning show w/news, sports reports and features)
1600	S/S	<i>Nightline Africa</i> (reports, interviews and analyses of African events)
1630	M-F	<i>Africa World Tonight</i> (African news, sports and weather)
1710	Sun.	<i>Voices of Africa</i> (interviews w/prominent Africans)
1730	Sun.	<i>Music Time in Africa</i> (traditional and modern African music)[part 1]
1800	M-F	<i>Africa World Tonight</i> (African news, sports and weather)
1910	Sat.	<i>Voices of Africa</i> (interviews w/prominent Africans)
1930	Sun.	<i>Music Time in Africa</i> (traditional and modern African music)[part 2]
1934	M-F	<i>World of Music</i> (popular music w/African roots)
2000	M-F	<i>Africa World Tonight</i> (African news, sports and weather)
2000	S/S	<i>Nightline Africa</i> (reports on world and African issues)

The importance that **Germany** places on Africa is demonstrated by Deutsche Welle's seven daily transmissions to the continent in English alone. News bulletins specially prepared for the African service air at 0400, 0600, 0900, 1100, 1600, 1900 and 2100. DW also offers three Africa-specific programs: *Good Morning Africa* features music, gossip and letters to DW and airs Tuesday through Friday at 0430; *African Kaleidoscope* examines recent issues and events in Africa at 0915, 1115 and 2115 on Saturdays; and the daily (Monday through Friday) *Africa Report* provides reports and background on African news, heard at 1130, 1630 and 1930.

The **French** continue to exert considerable influence in north, east and central Africa roughly north of the equator, where it was the primary colonial power. Many diverse nationality and exile groups from African countries also reside in France. These factors, along with a healthy French suspicion of others' motives on the continent, regularly bring France—willingly and unwillingly—into an active role in many African issues and conflicts.

RFI's 1600 transmission pays special atten-

tion to Africa with a daily half-hour newscast designed to present a complete panorama of African news, issues, sport and current affairs. East Africa gets its own special focus between 1700 and 1730. There are also a few short-form feature programs with an emphasis on Africa. These include: *Echoes from Africa*, on daily life in Africa, broadcast during the 1654 to 1730 block on Mondays, the 1230 to 1257 features block on Tuesdays and the 1630 to 1654 block on Thursdays; *Drumbeat*, a report on African culture and lifestyles, is broadcast during the 1630 to 1654 block on Tuesdays and the 1654 to 1730 block on Wednesdays; *Jumbo*, a weekly report on East Africa, is broadcast during the 1654 to 1730 block on Tuesdays. *Spotlight on Africa*, examining recent African events and issues, is broadcast Saturdays in the 1230 to 1257 feature block and 1630 to 1654 feature block, and on Sundays in the 1654 to 1730 block.

The **Netherlands'** ties to Africa stem from the Dutch East India Company's settlement of southern Africa, where Capetown was developed during the seventeenth and eighteenth centuries as an important port in the spice trade. Their descendants came to regard themselves more as Africans than Europeans. They are responsible for the development of a strong agricultural economy and the Afrikaans language, but also bear some of the responsibility for the creation and enforcement of apartheid policies only recently repudiated.

Radio Netherlands does not produce any special feature programs for Africa. However, its news bulletins and *Newsline* analysis program to Africa in the 1730, 1830 and 1930 transmissions are specially prepared daily with items of interest primarily for African audiences.

Of course, we have limited ourselves to a review of programs in the English language. An individual conversant in French, for example, would have another range of perspectives available. We can all appreciate the wonderful African music presented by *Afrique Numero Un* (Africa Number 1) between 0500 and 2300 on either 17675, 15475 or 9580 kHz.

Enjoy and learn about the African continent—available only on shortwave!

(Times and days in UTC. Frequencies for the programs listed can be had by referring to the 'Shortwave Guide' section of this magazine.) 'Shortwave Guide' section of this magazine.)

Air Show Fun

When it comes to aviation, some of the most fun a beginner can experience is to be found at air shows. For that matter, you don't even have to go to an air show to listen in. But, since this is May and we're thinking about getting out of the shack and into the sunlight, we'll talk about monitoring from the flight line.

Air shows have grown in popularity over the last decade or so. Further, since command and control of just about everything from the aircraft to the water fountains is subject to radio communication, monitoring air show activities has also grown. Both the popularity of air shows and the popularity of monitoring them will have an affect on how you carry yourself through the air show experience.

Let's start with the basics: Where do you find air shows? Most air shows are held on military reservations or at small and medium-sized commercial airports. The big commercial air hubs are usually not involved because interrupting the flight line for a day or two is simply not an option.

Start by making a few calls to the airports listed in your local phone book. You can also call the public information desk at nearby military air bases. If you're on the Internet, just point your browser's search engine toward the words "air shows" and you'll come up with plenty of places to go throughout the country. As you read this article you are right in the midst of the prime air show season, so get cracking.

■ Maximize your monitoring

Okay, you've discovered that nearby Wrongway Peachfuzz Air Force Base is holding a show in a few weeks. How do you go about getting ready to monitor activities at the show?

First you need to check out your receiver situation. It is a cruel world, and not all scanners are created equal. First you must determine if your scanner can receive aircraft frequencies and the all important AM mode. Air communication is commonly done in AM because this mode does not have the "capture effect" of FM.

Capture effect is when a strong signal dominates a receiver, eliminating any weaker signals. This is great for a car radio but not good when you're in the air hoping your



emergency or distress communications are being heard by the tower.

The important frequency ranges for air show aircraft monitoring include 108–137 MHz, the commercial aircraft band and 200–400 MHz, the military aircraft band. Also useful is the 406–420 MHz federal government frequency band, as this is often in use by military ground support operations at air shows.

Within the standard air band one frequency will need to go into a priority position. 123.40 MHz is recognized as the common air show frequency just about everywhere. Another frequency you will want to track down is that of the "Air Boss." This is the person who is running the whole show. If there are last-minute changes this will be where you'll hear about them first.

For example, I was at a show recently where the chatter on the Air Boss frequency told me that there was going to be a previously unscheduled "fly by" of a Korean War era MIG fighter. I not only knew the plane was coming in, but when and from what direction, well ahead of anyone not equipped with a scanner. The Air Boss frequency is usually a regularly assigned airport operation frequency which is set aside for that particular day, but check around to be sure.

Other frequencies you will want to know before you get to the show are the regular tower, ground control, approach control, departure control and air-to-air frequencies used at the airport or air base.

The big performers such as the Blue Angels, the Thunderbirds, or the Golden Knights all have a group of frequencies they use for doing their show. I've included the most recent information I was able to locate. These frequencies do change from time to time, as you can see by comparing this list with this month's cover feature. Also check the military land mobile frequencies between 137–144 MHz as these teams often use them for ground and maintenance operations.

■ More than just air

But wait a minute. There are a lot of other neat frequencies to consider besides the ones directly related to the guys (and gals) in the sky. The bigger air shows have been known to attract enough attendees to populate a small city. Tens of thousands of people need a certain amount of support and management. Consequently, many of the local public safety, fire and emergency management assets will also be on hand for the show.

My local ARES/RACES amateur radio group gives support communications to two local air shows each year, so even the ham frequencies in the 2 meter (144–148 MHz) and 70 centimeter (420–450 MHz) bands have high monitoring potential during many air shows. Then there are the various commercial operations to consider, such as the food vendors and such.

Don't roll your eyes and rule out the business band frequencies just yet. Many air show performers are in fact small business people and as such they maintain some level of operations on traditional business frequencies. In my experience it is worth the trouble to keep an ear on the business bands as yet another source of air show monitoring fun.

If you are able to get your hands on a second scanner, a good strategy is to load one up with the stuff pertinent to the flight line and the other with the public safety and business stuff. That way you can keep an ear on the airplanes while still figuring out what is happening at ground level.

U.S. Navy Blue Angels

121.900	Ground Support
241.400	Air to Air Channel
245.900	Air to Air Channel
246.600	Air to Air Channel
250.800	Air to Air Channel
251.600	Demonstration
263.350	Flight Line common
263.500	Air to Air Channel
275.350	Comm 1 Lead & Formation
302.100	Comm 2 Talk Back
302.150	Comm 3 Solos
307.700	Comm 2 Formation Talk Back
318.900	Air to Air Channel
319.800	Air to Air Channel
345.900	Air to Air Channel
348.600	Ground Support
360.400	Comm Solos
382.500	Air to Air Channel
384.400	Air to Air Channel
391.900	Air to Air Channel
395.500	Air to Air Channel
395.900	Air to Air Channel

U.S. Air Force Thunderbirds

120.450	Operations
236.550	Air to Air
236.600	Air to Air
241.400	Air to Air
273.500	Air to Air
283.500	Air to Air
294.700	Air to Air
322.300	Air to Air
322.600	Air to Air
382.900	Air to Air Tactical
394.000	Air to Air Tactical
413.025	Ground Support
120.450	Operations
250.850	Team Leader

U.S. Army Golden Knights

32.300	Operations
45.350	Primary
123.000	Air to ground support
123.450	Air to ground support
123.475	Air to ground support
123.500	Air to ground support

Equipment savvy

As for antennas, you're going to find yourself in the midst of an RF rich environment. The standard rubber duckies that come with any handheld scanner should do just fine. You may even experience overloading in close proximity to the transmitting equipment. In such cases, do the old poor man's attenuator trick: Just disconnect the duckie and listen in without an antenna attached. You'll be surprised at how well this will work. NASCAR fans have used this trick at race tracks for years.

A set of headphones is nearly essential to scanning at an air show. They cut down on the noise, allowing you to hear the conversations more clearly. If you take up my suggestion of using two scanners, it's easy enough to rewire a set of stereo headphones to allow you to monitor one scanner with each ear. I've used this technique at several air shows and other events with great success.

Digging for frequencies

Okay, so where do you unearth these frequencies? If the air show in question has been held for more than a year or two, head first for the internet. A quick search on the air show name coupled with the word "frequencies" is bound to turn up a list of someone else's prior successes. Don't forget to cruise some of the other columns in *MT* before any trip to an air show, especially Jean Baker's *Plane Talk*.

Other resources include books such as Bob Evan's *The Worldwide Aeronautical Communications Frequency Directory*, Tom Kneitel's *AirScan* or Robert A. Coburn's *Aeronautical Frequency Directory* (Grove carries most of these).

Personally, I also like to go to the original sources. I use the United States Government *Flight Information Publications, Airport/facility Directory* for my area. These are updated every eight weeks and can be purchased most anywhere that provides service to private pilots, such as local airports or chart and map stores. Not only will you get a look at important local frequencies with this publication, but you will also get a great deal of information about the airport itself. Unfortunately, this publication does not cover military air fields, but it still is useful for air shows and air monitoring that occurs beyond the government installations. Some larger libraries may also carry the local area books.

Remember, digging around for frequencies is half the fun of the radio hobby. And don't forget, if you come up with something new, please share it with the rest of us.

Okay now, you've got a scanner or two and you've loaded them up with frequencies. You're about to head out to the air show. What else is there?

Smart moves

Well, you may be ready to monitor all

those neat signals in the air and on the ground, but if you don't put a little more thought into your preparations you may not enjoy your listening experience to the fullest.

Get prepared for a long day. Most air shows can run from early in the morning until near sunset. Last year's NAS Oceanea, Virginia, Air Show even had an evening presentation. Now tack on to the actual show times an hour or so of traffic and parking delays to get in and out of the show area and you're looking at a full day.

The first obvious point is to have enough battery power for your scanners. Given the current drain of most common scanners, it wouldn't hurt to pack a second set of cells for each receiver. Maybe even some standard alkalines as backup if your rigs allow for it. A "fanny" pack or a small back pack should carry all your radio needs. If you're also carrying a camera, you will want to remember plenty of extra film because you will pay premium prices if you buy supplies from the vendors along the flight line.

While you're considering the energy needs of the scanners, don't forget the energy needs of the scannist as well. Pack along food or plan to buy it on scene. Most air shows have restrictions against coolers but you should be able to pack in a canteen or water bottle because it may be a long walk between water fountains.

If you've never been to a military base before, you will discover that the flight line is usually made up of a lot of nice shiny white concrete, which does a great job of magnifying the hot sun. Dress appropriately and plan to go through a tube or two of sunscreen. A brimmed hat and sunglasses are also important under such conditions.

So now you're all set; head out to the flight line and listen in on some of the best signals that scanning has to offer. Have fun. Keep em' flyin'!



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Q. Are the elements in the popular Grove Scanner Beam strong enough to be mounted horizontally rather than vertically as specified? (M. Mewes, Oakville, Ont.)

A. Certainly. The Scanner Beam is custom-made for Grove under contract with Antenna Craft, a leading manufacturer of TV antennas, using conventional TV antenna hardware and elements, and those are made to withstand self-supported, horizontal mounting.

Q. Why does an AC motor stay at the same speed, yet draw more current, when it is under load? (Mark Burns, Terre Haute, IN)

A. An AC motor is a transformer with a short-circuited secondary winding (armature) which spins because of the electromagnetic attraction/repulsion effects of the 60 Hz alternating

current. The spinning of the armature winding in the electromagnetic field of the primary (field) winding generates "counter EMF," a voltage which opposes the primary current.

When the armature is spinning freely (no load), synchronized with the 60 Hz field, the relative position of the armature at any instant in time produces maximum counter EMF, so very little current flows. But when a load is placed on the motor, causing the armature to slip (slow down), it is no longer synchronized, so it develops less counter-EMF. This means that more current flows, increasing the strength of the magnetic field, forcing the armature back toward its synchronized position.

Q. What equipment do I need to monitor 900 MHz digital telephones? (Johnny K., Hinton, WV)

A. You would need a matching digital telephone. 900 MHz digital phones are

unmonitorable by any consumer receiving equipment. Their signals are digital (broken into tiny, encoded, computerized "bits") and the spread-spectrum signal is transmitted over several megahertz of spectrum. Even if you had the equipment to hear it, monitoring cellular and cordless telephone calls is unlawful.

Q. Although it is unlawful for anyone in the U.S. to purchase domestically, or even import, cellular-capable scanners, can someone in Canada or any other country order such a product from a U.S. company like Grove Enterprises? (Wm. Mewes, Oakville, Ont.)

A. Absolutely. Grove Enterprises sells full-coverage scanning receivers to non-U.S. recipients, U.S. government agencies, and cellular service providers as allowable by law.

Bob's Tip of the Month

Digital Frequency Displays for Analog Radios

Many older radios, and most modern, inexpensive ones, have analog (slide rule) dials with dismal frequency accuracy. At one time several entrepreneurial manufacturers offered retrofitted digital displays to upgrade analog radios. But with the advent of digital displays in most medium- and high-end radios, these sources of add-on displays have become virtually extinct.

Reader Frank Shoemaker alerted us to the availability of a digital frequency display that can be added to many of these radios, including the popular GE Superadio and even multiband receivers, to provide much better frequency readout accuracy. Keep in mind, however, that the addition of such a device

requires surgery and should not be attempted by anyone inexperienced in electronics and soldering.

The device is available in two forms: a parts kit which includes all components and a circuit board for \$49.95, and a factory wired unit in a cabinet, ready to attach to the receiver's oscillator stage, for \$169 plus \$6 shipping. For more information contact the builder: Ron Hankins, KK4PK, 555 Seminole Woods Blvd., Geneva, FL 32732; ph. (407) 349-9150.

We know nothing about this individual or his product, so readers are advised to visit his Web site (www.aade.com) or call or write him for more information—and to recommend that he advertise his products in *MT*!

Q. Can I use the AC wiring through my apartment house as a longwire receiving antenna for shortwave listening? (Peter John Das, Reseda, CA)

A. You sure can, but with some precautions. First, you don't want to be electrocuted (bad), cause an electrical fire (also bad), or burn out your equipment (even worse!), so the 120 volts must never come into contact with the equipment.

The simplest way to isolate the signal from the line voltage is by connecting a capacitor between the wall plug and your receiver's antenna connector. Visit Radio Shack and get one rated at least 600 volts, with a capacitance of approximately 0.005 microfarad (μ F). Actually, anything from 0.001 to 0.01 will work just fine, but the voltage requirement is important to prevent failure.

The "hot" (AC line) connection must be enclosed; a convenient replacement appliance plug from Wal-Mart, your friendly hardware, or snipped off an old appliance, is ideal for this. Any visible AC wiring must be covered by a layer of PVC electrical tape.

The upside of the AC line antenna is that it's already there and probably intercepts plenty of signal voltage; the downside is that everyone's electrical and electronic appli-

Questions or tips sent to "Ask Bob," c/o MT are printed in this column as space permits. If you desire a prompt, personal reply, mail your questions along with a self-addressed stamped envelope (no telephone calls, please) in care of MT, or e-mail to bgrove@grove.net. (Please include your name and address.) The current "Ask Bob" is now online at our WWW site: www.grove.net/~grove

ances (including fluorescent lights, heater thermostats, and SCR dimmer controls—yuk!) are connected to it, and the electrical noise may be staggering. But you will never know unless you try.

Make-do antennas have always been popular among cliff dwellers. Many shortwave listeners (SWLs) have employed telephone wiring (also use the aforementioned capacitor, but you can get by with a 200 volt rating), bedsprings, flagpoles, rain gutters and downspouts, fire escapes, porch railings, and other metal extensions and contrivances.

Q. How well do the new "atomic clocks," available from companies like Zeit, work? (Jose Fernandez)

A. So far as we can tell, quite well. We have been trying unsuccessfully to get an evaluation sample of their new line to review for our readers. The clocks contain a tiny VLF receiver which picks up the time signals from WWVB, Ft. Collins, Colorado, on 60 kHz. Now that the power of WWVB has been increased, the usable area for such automatic-resetting clocks has increased over most of North and Central America.

Q. If I moved my Kiwi loop antenna from the basement to an upstairs location, will my signals improve? (Phil Davis, Troy, IL)

A. You betcha—assuming, of course, that the new location isn't near a source of electrical interference that wasn't present at the lower location. Move around, experiment with different locations for best performance.

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Hams on Longwave?

From time to time we've discussed the possibility of a licensed LF ham band in North America. Until recently, conventional thinking held that such a band would automatically be placed in the Part 15 (license-free) "Lowfer" (low frequency experimenters) band at 160 to 190 kHz. This has begun to change, however. The factors driving this are many, but perhaps the most significant is the fact that several European countries have approved bands well outside this range. This has strong implications for the hope of transcontinental distance reception (DX).

This month, John H. Davis of the Longwave Club of America shares his views on the subject. I urge readers to consider the issue seriously, and send their comments to the Federal Communications Commission (FCC) and the American Radio Relay League (ARRL) Section Manager for their area. (Refer to *QST* magazine or the League's web site at: <http://www.arrl.org/>)

A GUEST EDITORIAL

BY JOHN H. DAVIS (GA)

For most of this century, the name "amateur radio" was nearly synonymous with "shortwave" (HF). Recently, the two meter band and higher frequencies have been identified with ham radio. But longwave? Not since the very earliest years of this century, when ever-increasing pressure for commercial spectrum moved amateurs first to mediumwave, then to HF.

Until now.

Half a dozen European nations will have adopted the Council of European Postal and Telecommunications (CEPT) administrations' recommendation for a narrow ham band at 136 kHz before you read this. New Zealand, Australia, and Papua New Guinea already have amateur activity in the 160-190 kHz range. And our own ARRL may again be rousing itself to action.

What shape might an LF ham band take in North America, and what about the impact on existing experimental activity? As the Longwave Club of America's Part 15 beacon editor, I'm deeply concerned about that question.

Many Lowfer enthusiasts have engaged in a lively online dialog this past winter. One of the key questions is, why change anything? Some view a ham band as encroachment of new limitations and requirements into a relaxed

"One assumption about an LF ham band needs to be questioned at the outset—that it will automatically be at 160-190 kHz."

environment. Others don't want to see high power commercial rigs and idle rag-chewers take over, as on some ham bands. Ironically, these concerns are voiced less by the non-ham inhabitants of 1750M than by holders of licenses most likely to qualify for the new band.

Clearly, there is something unique about the challenge of a one-watt transmitter and a 15-meter antenna at LF. Amid the QRM and QRN (radio noise), nature awards DX grudgingly. It's a true test of skill to transmit or receive beyond a few miles, so multi-hundred mile contacts (QSOs) are a rare treat indeed. These challenges have prompted inexpensive implementation of advanced modulation methods, such as coherent Morse code (CW) and binary phase shift keying (BPSK).

But at some point, advancement of the radio art requires more signal-to-noise ratio. Some suggest raising Part 15 power or antenna limits, but the FCC places low priority on proposals that benefit so few people. Furthermore, Part 15 has no allocation status whatsoever, and will never receive the same consideration as a licensed service. In that sense, the freedom of license-free operation is also its biggest drawback.

Among amateur radio's objectives are development of circuitry and operating techniques for all kinds of radio propagation. It will not be hard to demonstrate that an LF ham band is consistent with this end. Thus, if international activity piques enough interest domestically, there will eventually be an LF ham band. The best approach, probably, is to be in the forefront, helping shape the final outcome.

One assumption about an LF ham band needs to be questioned at the outset—that it will automatically be at 160-190 kHz. About two years ago, the National Telecommunications and Information Administration (NTIA) mentioned this band in a proposal for additional amateur spectrum, and much discussion has gravitated toward it.

There's nothing magic about this choice. It's little used by critical services, so less engineering study would be needed than for other slots. And it's the widest chunk of spectrum one is likely to find at LF.

However, it's not necessarily the best place for a ham band. It might not be available in Alaska or large parts of Canada, due to aero-

nautical fixed service allocations north of the 60th parallel. There's absolutely no chance for transatlantic DX, given the megawatt longwave broadcasters (LWBC) there.

To avoid LWBC, one must look below 148.5 kHz. As it turns out, 130-160 kHz is allocated to similar services as 160-190. Avoiding ship assignments might make for a narrower band, but would still leave room for serious experimentation.

A longwave ham band would be valuable to experimenters. It might also attract new blood to the hobby, particularly if available to Technician Plus licensees. (There's lots more hands-on appeal to LF gear than a handie-talkie full of tiny surface mount components!)

Simultaneously, though, there is considerable benefit in preserving the challenge of Part 15 Lowfering. These two uses need not be mutually exclusive, whether through band sharing or two separate bands. This may be a rare opportunity to have our cake and eat it, too; but it will take thought and planning, both by amateurs and other users of this unique chunk of spectrum. [End quote]

■ Transmitter Project Update

The overwhelming vote was "YES!" to the question of whether or not to present a construction project here for a simple LF transmitter. I am working on two approaches—a homebrew design, and a ready-to-build kit. I plan to present the homebrew design next month.

I'm happy to report that with only minor changes, the homebrew circuit can be easily adapted to work on 136 kHz. This will be of interest to many European amateurs who are looking for a low power transmitter for the new LF ham band available in many countries.

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Skip Time

Finally, it's May! Even in the North, spring is here (barring any truly nasty surprises — when I lived in Wisconsin, I *did* see it snow in May). Things are getting noisy on the AM band, though it's still a good idea to keep checking the expanded band channels. But this is also the time of year the FM and TV channels start getting busy.

Sporadic-E skip is at its best beginning in mid-May. Look for signals on channels 2-6 beginning in mid-morning (around 9:00 a.m.), and again in early evening (beginning around 6:00 p.m.). Skip signals appear on the lowest channels first, and can be quite strong. On some evenings, I've been able to watch the entire early newscast on KIII-TV channel 3, over 850 miles from my location. Incidentally, if you find TV skip signals on channel 6, it's time to check your FM radio.

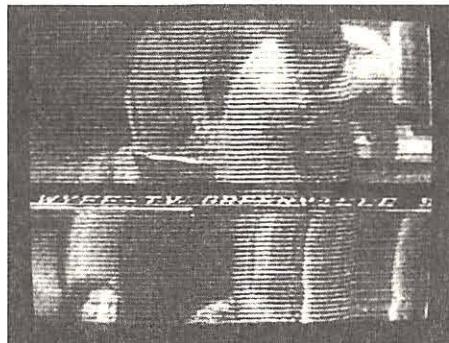
In the South, tropospheric propagation can happen all winter long. In northern climates, the tropo season is just getting started. Tropo DX doesn't go quite as far (stations more than 400 miles distant are quite rare), but all TV channels can be affected. The best openings are likely when cold, stable high-pressure systems are about to be pushed off by an approaching low. The best tropo signals are in the early morning, right around sunrise. But if (like me) you aren't a morning person, there's often also good DX in the evening.

■ Expanded-Band News

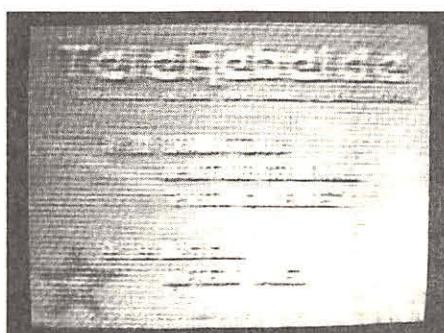
Two more stations appeared with little notice in February, and a third is expected any day now. WPHG is on 1620 from Atmore, Alabama, and carries a program of Southern Gospel music. This station has already been heard in Europe and is now the loudest X-band operation at my location near Nashville. KRIZ is also on 1620 in suburban Seattle with light urban music. Internet reports suggest KRIZ isn't all that strong and may be using 1 kW full time, instead of the 10 kW day power authorized for all expanded-band stations.

Finally, KKSL-1640 is expected to come on the air in suburban Portland, Oregon, by the time you read this. Oregon and Washington are tough states to log here in the East. KKSL and KRIZ should be popular loggings. WTDI-1670 in Wisconsin has *not* yet appeared on the air.

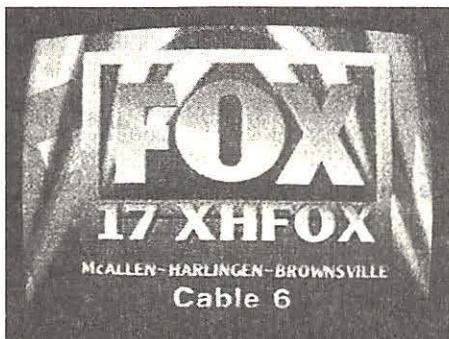
There have been changes to each of the two original X-band stations, too. 1310 kHz in



This photo shows E-skip reception of channel 4 in South Carolina, as received in Shreveport, Louisiana. WYFF-TV (and many other stations) transmits their call letters and city continuously in the "vertical interval." This identification is visible by intentionally misadjusting the vertical hold control.



Here's a picture of Cuban station Tele Rebelde, received on channel 2 in Shreveport. Danny Oglethorpe sent all the TV DX photos in this month's column.



The identification slide may list three Texas cities, but XHFOX channel 17 is actually located at Reynosa, Mexico. This UHF station was received by tropospheric propagation.

Oakland was the longtime home to soul station KDIA. In February, 1310 changed calls to KMKY. The legendary KDIA calls are now on the former KXBT-1640.

In the NYC area, the first X-band station, WJDM-1660, had been carrying the Radio Aahs children's network. Radio Aahs went out of business in February. WJDM (and the other former Aahs affiliates) has been carrying a rather exotic variety of music from the former Aahs headquarters in Minneapolis. Overnight (6pm-6am Central Time), they've been carrying the programming of "Beat Radio." Beat Radio was originally a pirate operating on 97.7FM in Minneapolis. They were "busted" by the FCC, but have now found a legitimate way onto the air. Beat Radio programs a dance music format.

■ Bits and Pieces

A few months ago, I reported a situation in Asheville, NC, that had two licensed stations competing for use of the same FM frequency. Zebulon Lee had won a permit for the use of 96.5 MHz in three hearings. But before a final hearing could be held, the FCC's hearing rules were overturned in court. Lee, who felt he'd legitimately won the license, refused a suggestion he enter into a partnership with the other applicants. He applied for call letters and put WZLS on the air himself.

Shortly thereafter, the FCC awarded the frequency to the other applicants, and granted them call letters. They built another station — also on 96.5FM — and put it on the air. Both stations operated on the same frequency for 24 hours, before a temporary court order shut down Lee's operation.

Now, WZLS has been returned to the air. Shortly before Christmas, a U.S. Appeals Court in Washington ruled the FCC acted improperly in granting the competing application. The Commission announced they would not challenge the ruling and would undo the changes.

We've had some interesting early-season E-skip openings already in 1998. Here's hoping there will be plenty more as you read this! Let us know what you're seeing and hearing. Send your loggings, news, and DX photos to: American Bandscan, Box 98, Brasstown NC 28902, or via the Internet at my new address: w9wi@bellsouth.net

FM Micropirate Growth Creates Controversy

The number of local pirates operating in the 88-108 MHz FM broadcast band has been skyrocketing in the United States. FCC Chairman Bill Kennard has estimated that several hundred are currently active. The low powered "micropirate" phenomenon is probably the biggest news of the year in unlicensed pirate broadcasting. Every month our readers send in several articles in newspapers across the USA that discuss local FM pirate operations.

For instance, Artie Bigley of St. Louis and Mike Jaeger of Des Moines found stories about **Radio Tejas**, a right-wing "clandestine" station on 95.9 kHz in Missouri, and **Iowa City Free Radio** on 88.7 MHz in Iowa. Maury Midlo found information on Texas pirates using 95.9 MHz from Austin and 105.9 in San Marcos.

The situation in my hometown of Cleveland is a good illustration. Five pirates are consistently active on a daily basis. The oldest, **Grid Radio**, transmits continuous dance music on 96.9 MHz from a night club located in the warehouse district of downtown Cleveland. Four other pirates are all commercial stations (!) with a Puerto Rican Hispanic format, using transmitters located in neighborhoods on Cleveland's near west side..

WSPL on 90.7 MHz is the oldest of Cleveland's Hispanic stations. It programs salsa music with DJ's, as do its competitors **Radio Coqui** on 91.9 MHz and **Radio Sabor Latino** on 93.7 MHz. **Radio Maranatha** also airs salsa tunes on 89.9 MHz, but its broadcasts are dominated by Spanish language religious programming.

Personnel from licensed broadcast stations in northeast Ohio have complained to the FCC about the pirates, citing interference claims. So far the FCC has not acted to close down the microbroadcasters. A similar situation prevails in cities across the United States. If you haven't scanned through the FM broadcast band lately, you could be missing some highly unusual pirate activity.

Rodger Skinner of TRA Communications Consultants, Inc. advises that he has filed a Petition for Rulemaking to create a low power FM broadcast service that would emphasize local ownership of the stations. If you'd like to view the text of his petition, given number RM-9242 by the FCC, <http://>



Radio Neehentchrin "pirated" R. Nederlands' logo in this QSL.

www.concentric.net/~radiotv has the material on the internet (see p. 4 for more).

■ Shortwave Pirate Frequency

Despite concern in pirate circles that the main 6955 kHz pirate frequency might be used at times by licensed shortwave broadcasters, such out-of-band SWBC transmissions had not materialized by our magazine's press time. Thus, if you're trying to hear pirates, the area between 6945 and 6970 kHz is still the best place to look. About 95% of all shortwave pirate activity remains in this area of the 43 meter band.

There have been experiments on other frequencies lately. **WREC** has been moving to 6850 kHz at times. Some broadcasts by **Jerry Rigged Radio** have been widely heard on 9965 kHz. With sunspot activity slowly increasing and with the return of longer spring and summer daylight hours, it's likely that some stations will operate just below the 19 meter broadcast band between 15010 and 15090 kHz. Sometimes the stations have given announcements on 6955 kHz before they move to unusual frequency ranges.

The most widely heard shortwave pirate remains **Radio Metallica Worldwide**. Dr. Tornado and Señor El Niño use a very powerful 10,000 watt transmitter, so they have been heard throughout North America and other world regions. Most operations are in the area around 6955 kHz, usually using AM modulation. Occasionally Dr. Tornado fires up the upper sideband mode of his transmitter. If you hear Metallica, reception reports (including three first class USA stamps for return postage) are welcome via PO Box 109, Blue Ridge Summit, PA 17214.

■ New Pirate Web Sites

A couple of pirate stations send word that they are operating new pirate web sites. You can find **Trans Atlantic Radio** at <http://home.wxs.nl/~trans> from Europe, while <http://www.angelfire.com/ne/actionradiois>

the site for **Action Radio** in the USA.

Many dozens of pirates maintain internet web sites, with audio from their broadcasts on a few of them. An excellent place to find references to pirate internet activity is the Free Radio Network site using the <http://www.frn.net/> URL. Another interesting "grassroots" free radio networking site is found at <http://www.radio4all.web.net> from the A-Infos Radio Project.

■ New Maildrop

An unusual new station, **Radio Neehentchrin**, is the first client of a new pirate maildrop for reception reports. PO Box 344, Bremen, IN 46506 has joined the ranks of the more established drops. QSLs have already materialized from the new station, as we see here, so this address has been verified. The other major maildrops used by North American pirates remain PO Box 452, Wellsville, NY 14895; PO Box 28413, Providence, RI 02908; Blue Ridge Summit (see above), and PO Box 293, Merlin, Ontario N0P 1W0.

■ Thanks!

Reader input is always welcome via PO Box 98, Brasstown, NC 28902, or via the e-mail address atop the column. We thank the following radio hobbyists for material used this month: Radio Animal, Pittsburgh, PA; Shawn Axelrod, Winnipeg, Manitoba; Artie Bigley, St. Louis, MO; Ranier Brandt, Hoefer, Germany; Dean Burgess, Manchester, MA; Pete Carron, Easton, PA; Jerry Coatsworth, Merlin, Ontario; Ross Comeau, Andover, MA; Joe Filipkowski, Providence, RI; Harold Frogde, Midland, MI; Nick Grace, Washington, DC; Frank Grelle, Mt. Carmel, CT; William Hassig, Mt. Prospect, IL; Mike Jaeger, Des Moines, IA; Rich and Talea Jurrens, Katy, TX; Kevin Klein, Neenah, WI; David Krause, Eastlake, OH; Greg Majewski, Oakdale, CT; Bill McClintock, Minneapolis, MN; Maury Midlo, Wimberley, TX; Don Moore, Davenport, IA; Kevin Nauta, Grand Rapids, MI; Gary Neal, Sugar Land, TX; Dick Pearce, Brattleboro, VT; Robert Ross, London, Ontario; Hank Schott, Newtown Square, PA; Lee Silvi, Mentor, OH; Niel Wolfish, Toronto, Ontario; and Andrew Yoder, Blue Ridge Summit, PA.

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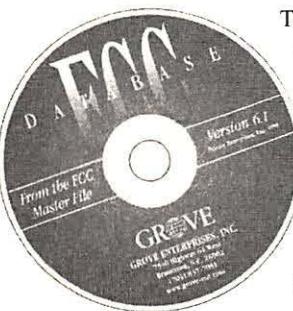
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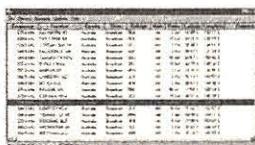
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Making the Case for Novice

There are many advantages to obtaining and using a Novice license in preference to a "No Code" Technician ticket. Unfortunately too many amateur Elmers, in their zeal to add new calls to the ranks, stress the No Code ticket as being the best way to go.

I do like the No Code ticket for several reasons. First, it does provide easy access to allow technically adept people to experiment with radio and learn more about the hobby. The No Code is also ideal for the wife or kids who want to keep in touch with dad, but are not interested enough in ham radio (at the moment) to take on the burden of learning the code.

But, the Novice offers advantages beyond the ability to get on the air and chat with locals or to hope for DX in the off chance six meters opens up.

When the Novice ticket first became available in the early 50s it allowed the new ham to operate 80 meter CW, 11 meter CW, and 2 meter phone/CW. The novice transmitter was allowed 75 watts power input and had to be crystal controlled. In addition, the license was good for only one year; at the end of that year the novice had to have passed a test for technician or higher grade of license or he was off the air!

The new Novice license is a vast improvement over the original: It is now a five year renewable license, allows CW on 80, 40, 15 and 10 meters, and FM on 222 MHz with power of 200 watts, VFO controlled.

As a Novice you can expect to work trans-continental and international stations. Typical daytime range on 80 is 3 to 400 miles; 40 extends this to 1000 miles or so; and 15 and 10 meters permit contacts almost anywhere on earth. Nighttime range on 80 extends from coast to coast. International contacts on this band are fairly rare, as many countries outside the U.S. and Canada are not allowed within the Novice bands.

At night 40 meters does permit some inter-continental contacts, but such contacts are rare due to interference from SW broadcast stations near these frequencies. Fifteen and 10 meters will usually close down a few hours after sundown, except during periods of high sunspot activity (coming soon!). 222 MHz is of course limited to local contacts most of the

time with occasional openings of a thousand miles or so in distance.

To obtain a Novice license you need to pass a very basic theory test. Typical study time of a week or less is required to obtain the knowledge to pass the Novice theory exam. There is a five word per minute code test required which on the average will take a month or two of concentrated study to pass—a small price to pay for what you will receive in return.

There are many aids to learning the code. Several different computer programs are available that will really ease the way for you. There are many code training programs on tape, although the computer is really preferred as a code teacher. Many ham clubs offer code and theory training. And, of course, there is always the individual Elmer.

If you can find a personal Elmer, so much the better, as one-on-one teaching can be very rewarding. Typically, the Elmered ham will have a leg up, since this personal coach will most likely offer use of his station while you are in the training period. He will help you overcome the fear of making that first contact, as well as showing you proper operating techniques—which few of the other methods offer.

After receiving your Novice ticket, a few months of regular operation and study will see you on the way to a General or higher class license with all of the attending privileges.

Compare this to typical VHF operation wherein normal contacts are local (i.e., a hundred miles or less) and there is little opportunity to work DX greater than a few hundred miles except during periods of exceptional conditions on six meters.

A Novice station can include almost any of the transceivers being offered today as they usually are limited to 200 watts or less. Or you can cheapen things up by going for used gear at your local hamfest. Expect to spend from \$200 dollars up for used gear and \$450 and up for new. Remember, this gear will be usable after you get your general, advanced, or extra class license, too.

Don't shortchange yourself: take advantage of what the Novice ticket offers. Elmers, take note and encourage the newcomers to go for the Novice and help themselves to more fun!

■ Six Meter AM

Remember the column a few months back, encouraging six meter operators to use AM mode if they have it? I have been monitoring AM on 50.4 MHz almost daily and am happy to report hearing several AM contacts each week since February. Happily, they are rag chew contacts—some lasting over an hour.

Most stations were located in the northeastern part of the USA, although I did hear several stations in the fourth call area one night. This is something I hope catches on big time. AM is a nice mode, sort of relaxing after running SSB with the vox kicking in and out.

Springtime and the E skip season will soon be upon us, so gear up for a lot of fun on six meters. Please be sure to send me your six meter reports for possible use in an upcoming column.

73 de Ike, N3IK

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The new Cherokee FR-465 from Wireless Marketing offers just about everything you might want in a Family Radio Service handi-talkie, and all of it executed with spit, polish, and innovation.

To begin, the FR-465 is scarcely bigger than a deck of playing cards: less than 4" tall (excluding antenna), less than 2-1/2" wide and less than 1" thick. At about 8 oz. weight, this radio is truly small and light enough to drop in a pocket and forget that it is there. Everyone who has seen the FR-465 has commented on its high quality look and feel. The entire body of the handi-talkie is covered in a rubberized silicone material of the same type that you'll find on extremely high-end binoculars.

On the front of the FR-465 are seven well-spaced soft rubber pushbuttons, a liquid crystal display, and an opening for the speaker and microphone. On the top of the radio are the antenna, an on/off/volume knob, and a rubber flap, under which you'll find connectors for an external speaker microphone. On the right side is connector for an external power supply with a protective rubber flap. On the left side you'll find a push-to-talk button and a function button.

On the back there is a belt clip and hand strap as well as a panel that slides away to provide access to five AAA batteries. On the bottom of the handi-talkie is a lock for the battery compartment and three connectors for a drop-in battery charger.

In designing the operating software for the Cherokee FR-465, the folks at Wireless Marketing have really struck a happy balance between simplicity and sophistication. On the one hand, a novice can simply turn on the handi-talkie and use the arrow buttons to change channels and the push-to-talk button to transmit. The auto-squelch takes care of the noise. This is the soul of easy operation.

On the other hand, by using the function button in combination with the seven buttons on the face of the radio, an advanced user can access a wide variety of sophisticated options to meet a range of communications needs. For example, the FR-465 has the ability to set CTCSS tones for either transmit and receive (or both), so that members of a group will only hear those transmissions that are intended for them.

In addition, unlike some competing FRS



The Cherokee FR-465 delivers top-gun FRS performance in a pint-sized package.

rigs, the FR-465 can set a CTCSS tone for one channel and not for another. This radio even has the capability to set different tones for different channels, and tones can be set for a channel and then turned on and off without going through the entire tone programming sequence — very handy!

One feature allows dual watch monitoring of two different channels. There are also scanning and memory features as well as the capability to set a transmit time-out limit, a feature that disables the transmit function while receiving a signal, a power save feature, and a programmable call channel.

Another slick feature makes this tiny transceiver ring like a telephone when a call is received. Press two buttons, the FR-465 changes from displaying channel and tone numbers to displaying channel and tone frequencies. All of the capabilities of the Cherokee FR-465 are explained in an extremely well written instruction booklet that never leaves the reader lost.

But aside from its good looks and wealth of features, the performance of the FR-465 is top-notch. The receive audio is loud and clear, and no other FRS radio offers greater transmit range (although some are its equal). And best

of all, it's in a package that can be slipped into a pocket on a moment's notice and used anywhere.

During my testing of the FR-465, I took advantage of its easy portability. My wife had sprained her back and was confined to bed for about three days. While I tried to maintain the household and look after our son, an FR-465, carried in my shirt pocket, was my constant companion. My wife had its twin in bed with her. When she needed something, she could key the microphone and communicate with me instantly anywhere in the house or yard or even while I was running an errand to a nearby store. Once you start exploring their possibilities, new uses for FRS radios keep popping up all the time!

The folks from Wireless Marketing have really done their homework on thinking about the FR-465 as part of a radio system. There are a whole host of accessories and options for this radio, including Nickel metal hydride batteries, a drop-in charger, a cigarette lighter powercord, a waterproof speaker microphone, a voice-activated headset microphone, and a variety of cases to protect the radio. I have tested many of the accessories, and they all live up to the high standard set by the FR-465 itself.

The suggested retail price for the FR-465 is \$179.95 (Grove has it for \$139.95), \$59.95 for the metal hydride battery pack, and \$89.95 for the drop-in charger. For additional information, contact Wireless Marketing at 1-800-259-0959.

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You Need dB Aware of Decibels

This month let's take a look at decibels. Perhaps we can even learn something about antennas and radio communications in the process.

■ First Things First

The "deci" in decibel refers to the fact that a decibel is just 1/10 of a bel. The "bel," a relative measure obtained by comparing two power levels, is named in honor of Alexander Graham Bell. The decibel (dB) scale is based on logarithms, and handles the range of values encountered with human hearing better than linear scales do.

For this reason bels and decibels are utilized extensively in telephone, audio and radio work where the electrical signals measured are to be converted to sound waves. Bel and decibel values can be obtained from voltage, current or power levels, but the equations in each case are constructed such that we are always comparing of two levels of power.

Let's have an example. The S-meter on your receiver indicates the relative power received from the incoming signal to which it is tuned. The basis of the S-unit scale is the decibel. Although there is not complete agree-

ment on the definition of an S-unit, one S-unit is generally accepted as equal to six dB. To be useful, all S-meters should give comparable measurements in comparable situations. Thus the S-9 level on all S-meters is calibrated to represent a value of 50 microvolts of received signal. Received signal strengths are then understood to be scaled on the S-meter as compared to the 50-microvolt level of S-9.

However, decibels are a comparison of power levels, so let's talk about watts. A 50-microvolt signal will yield 50 microwatts of power at the 50-ohm input resistance of your receiver. Let's say we receive a signal which measures 3 dB over S-9. On the decibel scale a 3 dB value represents a twofold change in power. So 3 dB higher than S-9 is twice 50 microwatts, or 100 microwatts received power. We report that as "S-9 plus 3 dB."

When the received signal power is decreased twofold as compared to S-9 it would be 3 dB (one-half S-unit) below S-9. A four-fold decrease compared to S-9 would be 6 dB (1 S-unit) below S-9. Of course we'd just report that as "S-8."

Luckily, we don't have to worry about changing watts to dB to use an S-meter. We

TABLE ONE

Typical Gain Figures For Some Popular Antennas

ANTENNA	GAIN dBi	GAIN dBd
ISOTROPIC	0.0	-2.1
QUARTERWAVE		
GROUND PLANE	.3	-1.8
DIPOLE	2.1	0.0
5/8 WAVE		
GROUNDPLANE	3.3	1.2
2-ELEMENT QUAD	9.0	7.0
3-ELEMENT YAGI	10.1	8.0

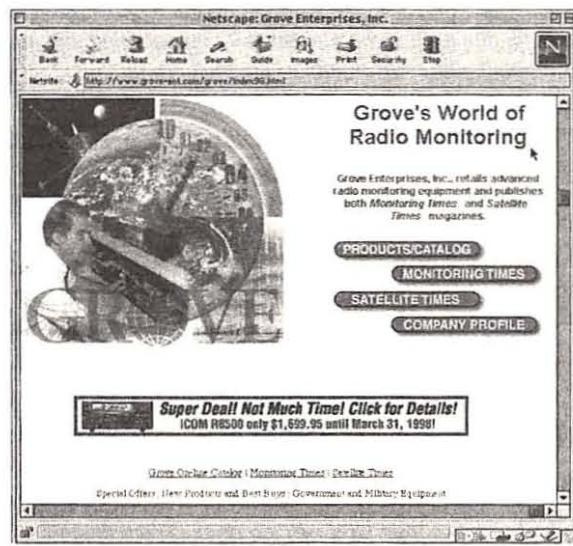
just read its face value and report it.

■ Antenna Gain

"Gain" is a term used to indicate the relative response of a receiving antenna to an incoming signal, or the relative strength of the field created when a signal is transmitted by that antenna. Gain indicates how the antenna under test compares to another antenna receiving or transmitting the same signal in the same direction, and at the same vertical angle.

Two standard antenna designs are generally used for comparison to measure antenna gain. One standard is our old friend the

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halfwave dipole. If you see an antenna gain measure reported as "3 dB" the last "d" in "dBd" means that the antenna whose gain was measured was compared to a dipole. The 3 dBd value means that the tested antenna had twice the received power a halfwave dipole would in the same situation. If the comparison of the dipole and the tested antenna indicated a negative gain of -3 dB the tested antenna would have only half the gain of the standard.

The other standard comparison antenna is the "isotropic" antenna. The isotropic antenna exists only in theory. It is said to be a point source of radio waves with no directional properties, transmitting equally well in all directions, or receiving equally well from all directions. Gain values relative to the isotropic antenna are reported in "dBi."

■ Buyer Beware

Table One gives some typical values of gain for several common antenna designs. It is important to understand that these gain figures are typical values, and that in each individual installation the antenna's gain may be somewhat different than the value given in the table. But the values do provide an indication of the relative performance of the antenna designs listed.

One thing to keep in mind when evaluating gain figures is that they represent the antenna's performance in the direction, and at the vertical elevation angle, at which the antenna gives the best performance. So gain for beam antennas is given for their performance in the direction, and at the vertical angle, at which they have the highest gain. It is up to the operator to orient the antenna to utilize that gain as they desire. The beam radiation and reception pattern may have this gain only at this one orientation, and may have very low gain, or even negative gain, in other directions. On the other hand, a nondirectional antenna has essentially the same gain in all directions.

As shown in Table One the dipole has 2.1 dBi gain as compared to the isotropic antenna. Obviously then, the dipole has more gain than an isotropic antenna. Many operators feel that using the dipole as the standard for comparison is more useful because they have a good idea of the dipole's typical performance. However, in engineering it is often preferable to use the isotropic reference antenna.

For our purposes suffice it to say that, when buying an antenna, you should be careful to notice which reference antenna is indicated in its claimed gain figures. Remember that reported gain figures given in dBi are 2.1 dB *higher* than gain for the same antenna reported in dBd. Thus, if an antenna's gain is stated in dBi it "looks" 2.1 dB better on paper

than it would if reported in dBd. Just subtract 2.1 dB from dBi gain figures to convert them to dBd gain levels. If you want to convert from dBd to dBi just add 2.1 dB to dBd gain figures.

RADIO RIDDLES

■ Last Month:

I said that "the term 'propagation' refers to the traveling of a radio signal from a transmitting antenna to a receiving antenna. Does either of these antennas help in determining the propagation path which the signal takes between the two antennas?"

Well, different antenna designs can have different vertical signal-launch angles (VSLAs). With transmitting antennas the VSLA at which the signal is launched affects the angle at which the signal strikes the F-layers of the ionosphere. Obviously then, the VSLA is instrumental in determining the length of the hop the signal makes. Antennas with high VSLAs give good short-skip performance whereas antennas with low VSLAs favor long skip distances.

So yes, the VSLA of the propagation path can be affected by the transmitting antenna. But can the transmitting antenna affect the *compass direction* utilized to reach the receiving antenna?

Ordinarily we think of communication over only the shortest great-circle route between stations because this is the most direct straight line between the transmitting and receiving antennas. But with a directional antenna it is possible to turn the launch direction 180 degrees from the direct route, and communicate via the long-path, great-circle route when that path is open to propagation.

Another application in which an antenna can affect compass direction of a propagation path is when we aim our signals north to utilize aurora reflection, and then work signals east or west of us. We can also sometimes point a UHF or VHF beam at a large building

or cliff, and use this to reflect signals between stations in an angular path rather than the direct, straight-line path we usually think of at these frequencies.

■ This Month:

Scatter propagation might well have been mentioned above as an application where the transmitting antenna affects the route of the signal to the receiving antenna. Why? What is scatter propagation?

You'll find an answer for this month's riddle, and much more, in next month's issue of *Monitoring Times*. 'Til then Peace, DX, 73

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Revisiting the Hombrew Computer

If you ever hankered to build your own IBM-PC/compatible computer, this may be the time. Prices have never been lower and information has never been easier to get, and the satisfaction is indescribable.

Refer to my four-part *MT* series (Nov-95 to Feb-96) on rolling your own PC. If you don't have those issues, you can get reprints (\$3 each) from *MT*. That series is the foundation of this month's update. Details have changed since then, but the mechanics and principles of building your own PC remain sound.

The Changes

The 80486 CPU and low end Pentiums, P60 through P120, are obsolete and unavailable now. The Pentium 133 is headed for obsolescence and may be gone by the time you read this. Industry sources say the entry level CPU is now the Pentium 166, so that's your clue to buy or build nothing less than a P200 MMX.

While 8-MB (even 4-MB) was adequate for 486's on MS-DOS or Windows 3.1, there is no escaping the absolute minimum of 16MB now and 32MB, if you're smart. Frankly, 64MB isn't overkill. Fortunately, RAM prices have dropped. A pair of 72-pin/60-ns/16-MB SIMMs (32-MB total) goes for \$60 or less.

You need a large hard disk drive. Anything under a gigabyte should only be a slave drive. The basic master drive (C:\) should be 2.1GB, cost of which is a bit over \$100. Cheer up! In 1983, Radio Shack's 5MB hard disk cost a whopping \$2500. Five or six years ago, a 345-MB drive was \$400.

Two years ago, I suggested a 486 for economy and ease of construction. The Pentium was just coming on strong. Now I recommend building for all the power your budget can handle; that is, put a little more in and get a lot more out. I don't recommend building in the bargain basement anymore because by the time it's built, it's outdated with little resale and growth value. The sweet spot for home-brew seems to be right in the

FIG-1: TYAN TOMCAT IV (S1564s)

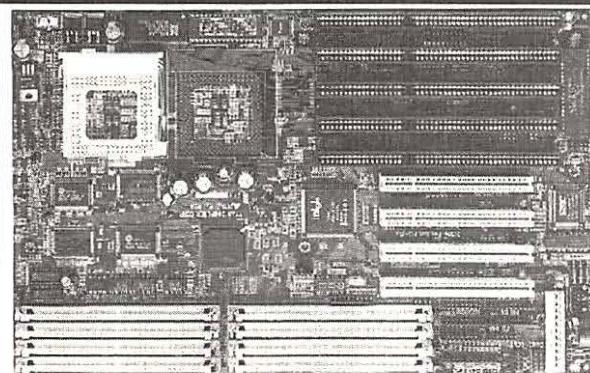
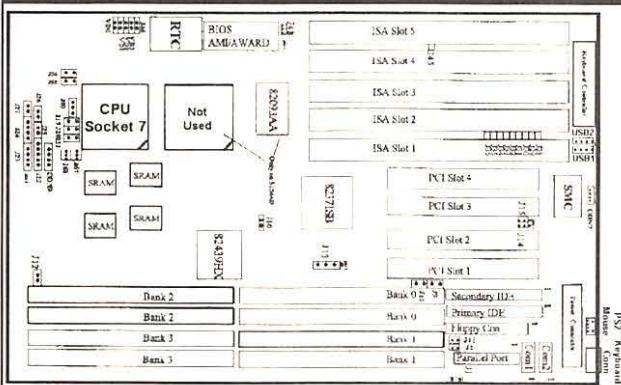


FIG-2: LAYOUT & LEGEND FOR FIG-1



middle of the technology curve. Stay away from the bottom because of poor value, and avoid the avant-garde top because you'll pay too much. A middle-of-the-road Pentium 200MMX computer will be very powerful and competitive for the next two or three years.

Prices on CD-ROMs, network, sound, and video cards have tumbled, but steer clear of the innovative leaders, if "bang for the buck" is important. A 16x CD-ROM, 16-bit sound card, and 2-MB video accelerator are all in the neighborhood of \$50 or less. There is little to be gained with the latest 34x CD-ROM and superwhizbang sound and video cards. Be conservative with add-on cards.

Yet, be liberal with the case, power supply, CPU, hard disk, and RAM. Mini-tower and desktop cases can be stifling. Undersized disks and RAM are a disservice. The power supply should be 225-watts or greater, though anything over 300-watts is probably overkill. A large, full-size tower case is ideal for those

who crawl in and out of their computers all the time. (Like me.) Look with a jaundiced eye at those ultra-modern, sleek "designer" cases with racing stripes and exhaust flames. Stick to the beige plain-jane mid or full size tower cases if you are an experimenter. You need room in which to work.

Forget 5-1/4" floppy drives; they're outmoded. A combo 3-1/2" / 5-1/4" floppy drive (both drives in a unit) is fine if 5-1/4" disks are still in your picture. Otherwise, a cheap 3-1/2" floppy will do.

The Motherboard

The motherboard is the heart and soul of a PC. Get a good one; not a cheapo. You stand a good chance of not going wrong if the motherboard comes with one or two Universal Serial Bus (USB) ports.

I know, Windows 95a doesn't support USB (Windows 95b and Windows 98 do!) and few peripherals are available yet, but USB is the coming thing to replace the archaic serial I/O port. USB will be commonplace in two years. If your motherboard is equipped with USB and an Intel 430HX "chipset," you will probably be okay. Watch the cache, though! Some boards come with 256kB cache, but that's not enough. Insist on 512kB external cache memory. 1MB is probably overkill and costly.

Figures 1 and 2 show what I think to be representative of a good quality motherboard. The Tyan Tomcat IV comes with 512kB cache, an Intel 430HX chipset (best all-round chipset to date), and support for Cyrix, AMD, and Intel CPU speeds of 75 MHz through 233 MHz. Also standard on-board are four 32-bit PCI slots; five 16-bit ISA slots; two PCI bus-master enhanced IDE ports for four hard disk drives plus an EIDE CD-ROM; on-board I/O with IR; dual floppy drive port; two 16C550 high speed serial ports; one ECP/EPP high speed parallel port; two USB ports rev 1.2; one IR port; and a PS/2 mouse port. The Tomcat IV comes with cables and choice of Award or AMI BIOS. The price is roughly

\$140. Add RAM and CPU to round out the board.

If I'm talking over your head here, relax — just check the specs of the prospective motherboard to ensure that their jargon matches mine. Understanding this stuff isn't as important as having it.

■ The Peripherals

A great computer for radio starts with a good case, power supply and motherboard, with a middle-of-the-road CPU and plenty of RAM. And you can almost stop there, since the rest of the stuff is so cheap that even if you make a mistake, it won't be a catastrophe. Still, there is a bit to know.

For instance, there are two kinds of prices on hard drives, CD-ROMs, sound, video, and network cards. One price is for the retail consumer and comes in a shrink-wrapped box stuffed with promo literature and books that never get read. For example, a Soundblaster AWE64 in the box costs roughly \$100. But the OEM version (same thing) without box and frills is under \$70. If you'll settle for off-brand, you can get the same thing for under \$20. I am very impressed with a no-name \$15 sound card I snagged from Fry's Electronics.

Brand-names are not too important for sound, network, and video cards. I would stick to name brands for hard disk drives, though, including Western Digital, Maxtor, Seagate, Fujitsu, Quantum, and IBM.

■ Price Guide

Table 1 shows a sampling of prices you can expect if you "roll your own." Where possible, I listed ranges. If you see prices much higher, beware: they're too high. You might find lower prices — I tried to not low-ball my guide. I just want to keep you from paying too much.

From Table 1, it can be seen that a do-it-yourself Pentium PC can cost about \$800, less monitor, if you have to go out and buy everything. This might not be much of a deal! Fry's Electronics offers a ready-to-run Supercom Pentium 200MMx with 16-MB RAM; 2.1-GB HD; 24x CD-ROM; Diamond

TABLE 1: COMPONENTS OF A PC

ITEM	NOTES	PRICE RANGE
Case & Power Supply	Mid/full	\$22 - \$80
Motherboard		\$100 - \$175
Pentium 200 MMx		\$120 - \$140
RAM (memory)	32MB EDO	\$60 - \$70
Hard disk drive	2.1GB EIDE	\$110 - \$130 OEM
3.5" floppy disk drive		\$25
CD-ROM	16x/up	\$50 - \$80
Video card, 2 MB	PCI	\$40 - \$100
Sound Card, 16-bit	ISA	\$15 - \$30
Speakers	Stereo	\$15 - \$30
Microphone	Stereo	\$10
Modem/internal	56kB/sec	\$39 - \$129
Keyboard	Windows	\$20
Mouse	PS/2	\$10
Network card	PCI	\$19 - \$79
Monitor	17" 1.28	\$500

This is only a guide — your mileage may vary.

Stealth 2-MB video; 16-bit full duplex sound card; 56-kB/s modem; speakers, keyboard, mouse, and Windows 95, all for \$850, less monitor. I bought one for a client because I couldn't beat the price and provide Windows 95, too!

You can beat the price if you have any surplus parts. Even a case, power supply, keyboard, and mouse are a good start to saving money when rolling your own. Every little bit helps! Maybe it's time to recycle those old 286/386/486 computers into a cost-effective upgrade...

■ Other Clues

Don't count on older RAM. Pentium computers require 72-pin (or 144-pin) RAM rated at 60-ns or faster. Older RAM isn't likely to be useful. Don't even think about a primary disk drive smaller than 512-MB. Get a larger, faster, more reliable drive for your valued programs and data.

Monitors have dropped in price. A 17" SVGA is the sweet spot now. I have a 15"

TABLE 2: RESOURCES FOR BUILDING A PC

DESCRIPTION	WEB SITE ADDRESS
Motherboard Manufacturers Sites	
Tyan	http://www.tyan.com/
Shuttle	http://www.spacewalker.com/
Giga-Byte	http://www.giga-byte.com/
EFA	http://www.efacorp.com/
Asus	http://www.asus.com/
SuperMicro	http://www.supermicro.com/
Hardware and Other Support Sites	
Tom's Hardware Guide	http://sysdoc.pair.com/
Need drivers?	http://www.drivershq.com/
System Optimization	http://www.sysopt.com/
Misc Hardware	http://www.venus.it/homes/spumador/

These sites have links to other great references!

Trinitron™ that impresses me, but your eyesight and yen for value should focus on 17" monitors.

Motherboard "chipsets" are very important and Intel's 430HX is the best yet for the Pentium 133-233MMx CPUs. Insist on the 430HX unless you know exactly what you want!

Table 2 lists a few power-breakfast resources to support your PC-building adventure. Don't buy a book on this subject — computer books go out of date too quickly now.

■ Networks

If you have two or more PC's, you should network them for the tremendous values of synergy and experience. Anyone can put up a small local area network now. I'll get into the nitty-gritty of LANs next month so watch your topknot and stay tuned; cool stuff is coming down!

■ Support Notes

If you can't hit my published Internet sites, go to <http://ourworld.compuserve.com/homepages/bcheek> where the current addresses for my better Web and FTP sites will always be posted. You can e-mail me for current addresses, too.

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Making a Station Engineering Manual

This month we will be looking at ways to make life a little easier around the shack by documenting *exactly* what is in the shack in an engineering manual.

The idea of compiling all the technical data for everything in a facility is not new. In the US Air Force, we had Facility Training Manuals that detailed everything about our technical control facility. Microwave and ground radio maintenance, flight facilities, inside/outside plant maintenance and AUTOVON/AUTODIN maintenance all had their FTMs.

Broadcast stations where I've worked had similar volumes dedicated to how the station was wired, what cable pairs went where, how to tune the transmitter, and even how to turn it on and power it down. Why should an SWL/ham shack be any different?

Organization is one major reason for creating a station engineering manual. A reference source on how everything in the shack is interconnected can help you solve problems quickly when they arise. I know for a fact that big gun contesters and DXers all have station engineering manuals where the operator can go to find out how the antenna rotors are wired, coaxial cable routings, mic/headset pinouts, rig schematics/manuals, etc.

This month, we are going to embark on the technical documentation of my station at K7SZ, to give you an idea of how to how compile a station engineering manual. This will be a good exercise for me as well, since it has been over three years since I have updated my documentation, and a lot has changed in



The current line-up at K7SZ, L-R from the top: Denton MT3000A tuner, Drake MS-4 speaker, Drake TR4C HF SSB/CW transceiver. 2nd shelf: amplified speaker, Wilderness Radio Sierra, Ten-Tec Century-22 and Yaesu FT301D HF transceivers. The Ten-Tec 1208 6m is off camera. Note the Alpha Delta four-position RF switch which controls the antennas.

those ensuing years. My wife says that I change radio gear faster than most women change shoes!

I enjoy buying and/or trading gear. I have a special place in my heart for tube-type ("boatanchor" or BA) gear. Restoring BAs has become one of the true pleasures of my radio pastime. I also like low power (QRP) equipment and selected shortwave gear. Therefore, my shack tends to change a lot as I restore a piece, use it for a few months, and trade it off for another piece. Still, this is no excuse for not having an up-to-date engineering manual.

Start at the signal

Where do you start? Start at the antenna and work backward to the AC outlet. Figure

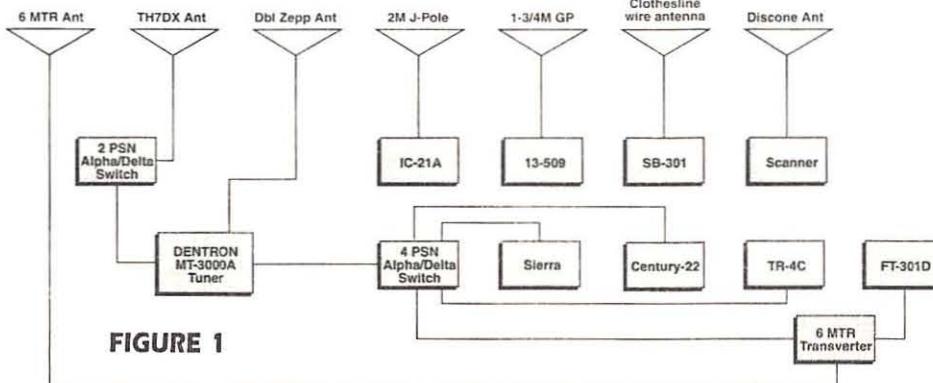


FIGURE 1

1 shows how my antennas are arranged. For HF I use three primary antennas: a HyGain TH7DX 7 element Yagi-Uda type beam antenna for 20/15/10 meters, and an extended double-Zepp for 160/80/40/30 meters. A three element 6 meter beam by MFJ sits above the TH7 to give me directional capabilities on the "magic band."

Notice that I have also included an end-fed wire (my clothesline antenna, actually) along with omnidirectional antennas for 2 and 1.75 meters. In addition, there is a Lakeview VHF/UHF discone omni attached to the 35 foot point on my tower which is used by the scanners. This makes a total of seven antennas in use at K7SZ. The extended double-Zepp does double duty as a SW antenna.

Coaxial cables from the antennas are sequentially numbered and noted in the engineering manual. Notice that the Zepp antenna is fed with 450 ohm ladder line which is not easily confused with coaxial cable. While the coax cables enter the shack through a 3 inch pipe/feedthrough near the ceiling, the Zepp's ladder line and the end-fed "clothesline" wire antenna come in at the bottom of the shack window. The end-fed wire is connected directly to the Heathkit SB-310 shortwave receiver.

The TH7DX triband beam antenna cable is connected to a dual position Alpha-Delta antenna switch. The other position of this switch is left unterminated. The output of this switch is routed to a Dentron MT-3000A antenna tuning unit. This ATU has a built in 300 watt dummy load, forward/reflected power metering and antenna switching for 3 coaxial lines, one end-fed wire, and balanced feedline. In addition, it is a *big* tuner, capable of handling 3 kilowatts! The ladder line from the Zepp antenna is also connected to the Dentron ATU at the "Balanced Line" input port.

The output of the Dentron MT-3000A is routed to another Alpha-Delta coaxial switch, this one having four outputs. Each output port is connected to an HF radio in the following order: Radio 1 - Wilderness Sierra multi-band QRP CW transceiver; Radio 2 - Ten-

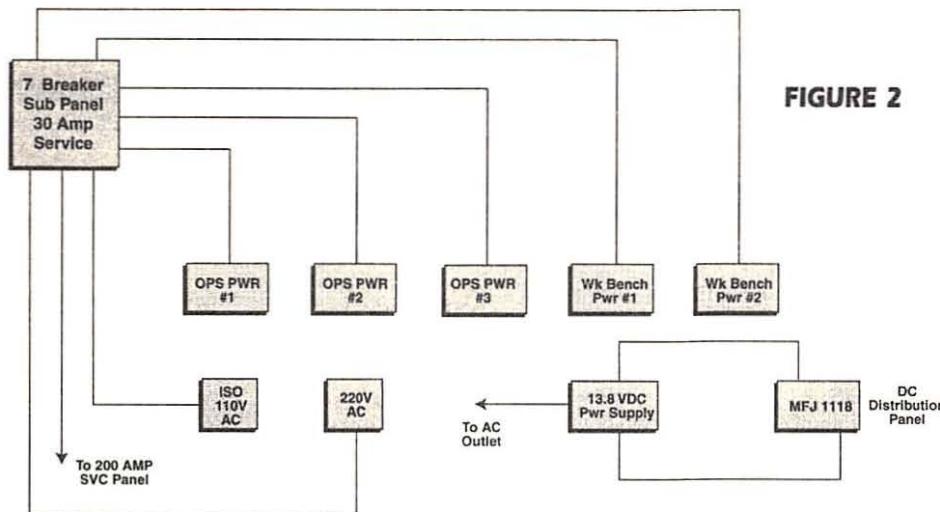


FIGURE 2

Tec Century-22 CW transceiver; Radio 3 - Drake TR-4C SSB/CW transceiver; Radio 4 - Yaesu FT-301SD QRP SSB/CW transceiver.

Note the Ten-Tec Model 1208 6 meter transverter in line with port four of the antenna switch. The 6 meter beam antenna is connected directly to the transverter. Switching between the HF and 6 meter antennas is done at the transverter.

This antenna switching arrangement allows me to switch any one of the four HF rigs between the Zepp and beam antennas, providing great flexibility. All antenna switches and the Dentron tuner are grounded to the station ground buss, and the two Alpha-Delta switches also provide lightning and static discharge protection via their patented Arc Plug™.

The other four antennas are routed directly to their respective radios. Lightning protection is provided by disconnecting the coax or wire and connecting it to station ground.

I have diagrammed the rotor cable pinout on the HyGain/Telex HAM-IV rotor to show which color wires go to which terminals on the rotor control box. This saves time and hassles in the event you have to work on the rotor control box or a wire comes off of a terminal.

■ Power Sources

So much for the RF end of things. Now we proceed to the power distribution for the shack. Figure 2 shows the various power connections available at K7SZ. Eventually, all the AC and DC power supplies will be replaced with solar charged batteries, enabling the entire shack to be run off of 12 Volts DC with the exception of the Drake TR-4C, SB-310, the rotor control box, and the shack computer.

When I remodeled the

vided by an MFJ 1118 DC power distribution box. This unit provides two high current (up to 30 amps) taps for transceivers and an additional six low current taps for accessories. Voltage is monitored via an analog meter on the DC distribution box. The MFJ 1118 is wired to the output of the DC power supply via a length of #8 AWG wire.

■ Wired for Audio

Microphone audio connections for HF are done via a series of adaptor cables made to interface a Shure 444D mic to the Drake TR-4 and the Yaesu FT-301SD transceivers. The Icom IC-21A 2 meter (146 MHz) and Midland 13-509 1.75 meter (220 MHz) rigs have their own mics which plug into their respective jacks on the radios.

For quick reference, I have included these jack/plug pinouts in Figure 3. In addition, I have included the basic wiring for the Shure 444D mic and the various adapter cables. Eventually, I am adding a Heil boom mic with dual HC-4/5 elements which will be directed via a multiposition switch to one of the four transceivers.

Receive audio from each rig can be patched to one of two Radio Shack DSP filter units which allows additional audio filtration. I can't say enough good things about these small, inexpensive DSP units from Radio Shack. Unfortunately, they are no longer manufactured, so your best bet is to find one at a flea market or hamfest. Going rate is \$20 to \$25, and they are worth every penny.

The output from the DSP filter is passed to one of two Radio Shack Minimus Seven speakers. In the past, I have experimented with running receiver audio through a Sony stereo equalizer prior to the DSP units, but found that this additional step of audio conditioning was not really worth the effort.

Operations and service manuals for each piece of gear in the shack are also included in the engineering manual. This includes schematic diagrams, modification sheets, plus any correspondence with the factory or supplier.

There are several ways to store all this newly accumulated information. I have used large three-ring binders, accordion files, and file folders in a filing cabinet. Of these methods, I like the filing cabinet idea best, since I have a lot of gear and three ring binders can get very cumbersome.

Thus concludes the overview of how I have my station arranged. I realize that your station may be much simpler or much more complex than mine, so use your imagination and plan your installation with flexibility and convenience of operation in mind.

Have fun and remember to **Keep It Simple**.

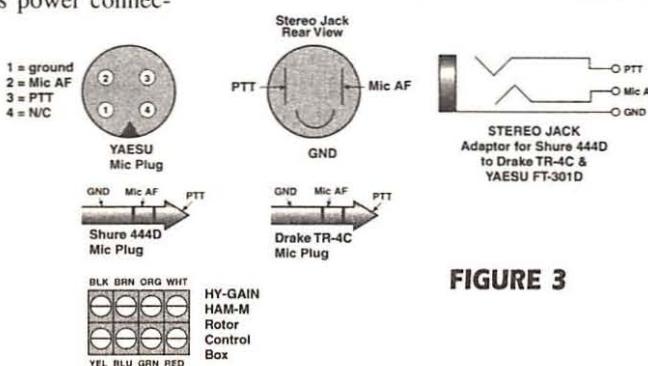


FIGURE 3

Data Frequencies in the Fed Bands

One of our monthly contributors, Ken Windyka, up in Springfield, Mass., writes to inform us of a very interesting Web Page. It is <http://www.ntia.doc.gov>. This is the web page of the National Telecommunications and Information Administration (NTIA) which performs the same function for the federal government that the FCC does for the private sector. This NTIA website provides a lot of information on federal government frequencies and the latest decisions of the government regarding telecommunications use.

One interesting item of note on the above website is the 1996 edition of the NTIA *Manual of Regulations and Procedures for Radio Frequency Management*, which is the bible for federal frequency management, federal communications systems planning and construction. Chapter 4 in this manual has a list of the "splinter" frequencies in the 162-174 and 406-420 MHz range. There are currently 78 such frequencies now available for all federal government agencies to use with an absolute minimum of coordination.

These are data channels only and no voice is authorized on any of these frequencies. Also note these frequencies have very low powered devices on them that are only capable of 5 to 10 kHz bandwidths.

Obviously, the typical scanner is not going to be able to enter a frequency like 162.803125 down to the last digit, but your scanner can come close. For example, you will have no problem hearing a signal transmitting on 162.590625 MHz even if you can only enter 162.590 or 162.595 into your scanner.

162-174 MHz Splinter Frequencies

162.590625	162.593750	162.596875
162.803125	162.806250	162.808375
163.390625	163.393750	163.396875
163.603125	163.606250	163.609375
163.790625	163.793750	163.796875
164.003125	164.006250	164.009375
164.840625	164.843750	164.846875
165.803125	165.806250	165.809375
166.415625	166.418750	166.421875
166.653125	166.656250	166.658375
167.190625	167.193750	167.196875
167.803125	167.806250	167.809375
171.215625	171.218750	171.221875
171.403125	171.406250	171.409375
173.190625	173.193750	173.196875

406-420 MHz Splinter Frequencies

406.265625	406.268750	406.271875
406.278125	406.281250	406.284375
408.490625	408.493750	408.496875
408.503125	408.506250	408.509375
408.965625	408.968750	408.971875

408.978125 408.981250 408.984375
409.865625 409.868750 409.871875
409.878125 409.881250 409.884375
416.790625 416.793750 409.796875
409.803125 409.806250 409.809375
419.990625 419.993750 419.996875

All of the splinter frequencies shown above are shared by all United States government agencies.

More Shared Frequencies

The splinter frequencies mentioned previously aren't the only shared frequencies in the government spectrum. Just as in the civilian VHF/UHF spectrum, the government has eight itinerant or multi-user frequencies that various agencies share.

The frequencies 163.100, 416.050 and 418.575 MHz are authorized for use by all U.S. government agencies and are there for intermittent wide area requirements of a transient nature. These frequencies do not require prior NTIA coordination.

Just above the 11-meter CB band are two more interesting government frequencies—27.575 and 27.585 MHz. These two allocations are used for intermittent, short distance, low power radio communications, signalling, and the radio control of objects and other devices by a variety of government agencies.

Finally, we have 168.350, 408.400, and 418.075 MHz. These frequencies can also be used by any government agency. They are authorized for use when the communications need by a particular agency does not justify the full coordination of an exclusive government frequency assignment.

These eight government itinerant frequencies should be loaded in every federal monitor's scanner. You just never, ever know what you're going to hear on these neat frequencies.

National Interagency Fire Center

Some discussion on the FedCom list server regarding the National Interagency Fire Center (NIFC) reminds me it may be time to clarify the mission and purpose of this federal agency.

The NIFC was formerly known as the Boise Interagency Fire Cache. The name was changed in 1993 to more accurately reflect the center's national mission. The old BIFC was organized several years ago to make better nationwide use of resources, including na-

tionwide radio frequencies, when fighting a large forest fire. The initial use of the program was for fires on federally owned lands, such as national parks and national forests. This mission has now been expanded to include fires anywhere in the country; hence the redesignation of the NIFC name.

Here's an example of what can happen with a common cache—and of the kind of activity you may be able to monitor. A few years ago during an extremely high fire season in New Hampshire, the NIFC sent a large tanker airplane to stand by in Manchester. Although it was never used in the New Hampshire area, it did see service in Massachusetts. In addition, part of the radio frequency cache that was located in Maine had been requested to a fire in southern New Hampshire. Although the fire had been expected to last quite a while, it was contained quicker than expected and the radios arrived after the fires were extinguished.

Here are some of the reported frequencies for the NIFC:

F-1 166.725	Simplex
F-2 166.775	Simplex
F-3 168.250	Simplex
F-4 168.400	Simplex
F-5 168.400	Input to 166.6125

Command net

C-1	170.975	Repeater in
	168.700	Repeater out
C-2	170.450	Repeater in
	168.100	Repeater out
C-3	170.425	Repeater in
	168.075	Repeater out
C-4	172.250	Repeater in
	169.875	Repeater out
C-5	171.500	Repeater in
	169.175	Repeater out

Incident Command Channel

C-1	411.825	Repeater in
	417.300	Repeater out
C-2	411.850	Repeater in
	417.350	Repeater out
C-3	411.875	Repeater in
	417.500	Repeater out
C-4	411.925	Repeater in
	417.800	Repeater out

Division of Fire, Aviation, and Safety

Channel	Frequency	
01	168.550	Air calling simplex
02	168.625	Air guard simplex



Tools of the Trade: Radar

Welcome aboard! Today we shall continue with our look at air traffic controllers' ("tracon") tools of the trade. The radar room is somewhat more exotic looking than the tower cab we discussed last month, but does offer essentially similar equipment, except for the windows.

Controllers in this setting employ a strip printer for information about arriving and departing aircraft. They have telephones linked to the tower, to the center, to the National Weather Service, and to other airport operations; dedicated VHF bands and the shared UHF band, emergency frequencies; wind indicators; the altimeter setting; the RVR indicator; and current weather information hook-ups. The major difference between the tower and tracon is the presence of the radar scopes.

Terminal Radar - This system has a range of 60 nautical miles and completes an antenna rotation (that is, it updates the picture) about every five seconds.

Transponder and Interrogator - The transponder is the part of the radar system that is carried on board the aircraft. The other half is an interrogator, which is usually attached to the radar antenna on the ground. The ground equipment interrogates the transponder on board the aircraft, which responds with a signal that is set to one of 4,096 possible codes. For example, if a pilot is told to dial in (squawk) 2016 on his transponder, the equipment will reply to the interrogator with a signal that will be interpreted as 2016. In most operational transponders, part of the signal to the ground will include the aircraft's altitude in hundreds of feet as well.

Computer Data Blocks - The target derived from the transponder signal overlies the primary target so that they are almost indistinguishable. The computer identifies the discrete transponder code 2016 as one assigned to a specific aircraft (say, Delta 124), and generates a data block for DL 124. The aircraft's position is identified by a position symbol indicating which controller is working the plane. A short leader line connects the data block with the position symbol. The full data block contains the aircraft identification, its altitude, and its ground speed, which is calculated by the computer based on target movement.

Trackball - Controllers have a computer input device known as a trackball at each

console. The plastic sphere that spins beneath the controller's fingers and acts like the familiar computer "mouse." Rotating the trackball moves the cursor on the radar scope to a target or piece of information the controller wants to identify to the computer.

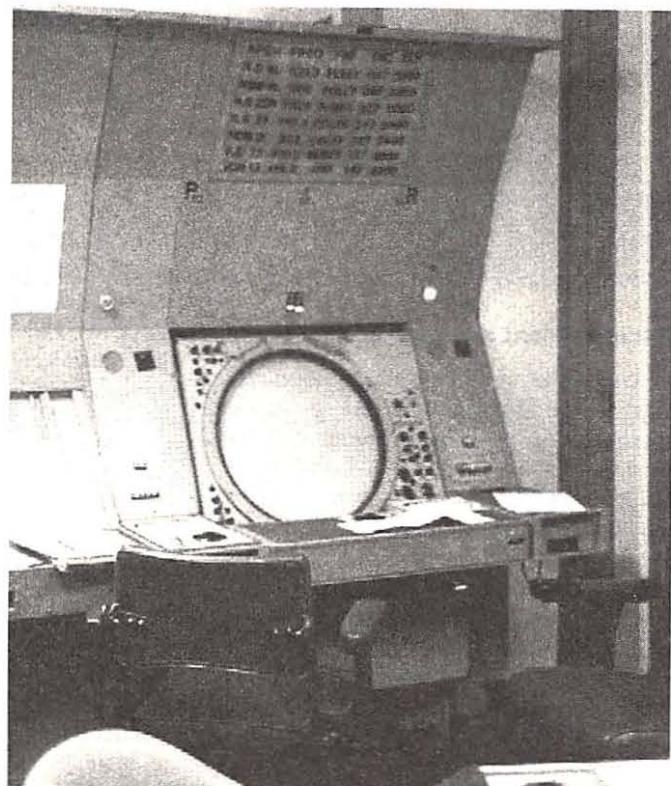
This is one of several ways that information is sent into the computer. Data can also be identified by using the aircraft's identification number or computer number in the data block. A keypad is also at each control position for controllers to use to key information into the computer system.

When a departure aircraft reaches a predetermined point after takeoff the computer initiates an automatic handoff to the center. When the handoff is accepted by the center computer and control of the aircraft is accepted by that facility, the data block drops off the departure scope. Inbound aircraft are handed off to the approach controller from the center in a similar fashion.

Automated Radar Terminal System (ARTS III) - Major facilities employ the ARTS III. It uses primary radar returns created by bouncing the radar single off the surface of the aircraft, and secondary radar signals generated by a transponder in the aircraft.

ARTS III Software - The ARTS III software incorporates two significant enhancements. The first is conflict alert. It warns the controller that aircraft are about to lose separation; that is, to move too closely to each other. In the terminal area, aircraft operate so close together that the parameters for this software program are set virtually at the minimum. Therefore, when the alert goes off, it is usually too late to maintain the legal separation, but the warning allows sufficient time for the controllers to avert a potentially dangerous situation.

The second enhancement to the ARTS III



The radar controller's window is his radar screen.

software is the minimum safe altitude warning system. It sounds an alarm when the aircraft descends below the minimum safe altitude for the terrain in question.

Video Map - An integral part of any terminal radar system is the video map. It features a series of solid, dashed, and curved lines, boxes, and circles. Each symbol means something to the controller. After a little orientation, it is possible to identify the primary and secondary airports, the runway center lines, and the aids to navigation serving the airport and the local area. Also seen are the boundary of the facility's airspace and subdivisions of that airspace, which play a part in the segregation of traffic, as well as prominent landmarks used as reporting points by Visual Flight Rules (VFR) aircraft. The video map seems as real to the controller as the picture seen out of windows.

That's all for now. Next month, we'll finish up on the tools of the trade subject and have readers' input. Until then, 73 and out.

LISTEN TO THE ANGELS.....

.....AND TO THE BIRDS, TOO!



ICOM R10



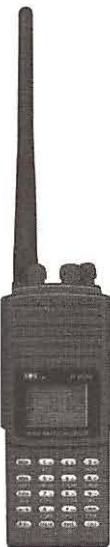
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WHAT'S NEW?

TELL THEM YOU SAW IT IN MONITORING TIMES

Sony Enters the Scanning Market!

Sony is showing its confidence in the scanner market by releasing two handheld scanners, the SC-1 and ICF-SC1PC (the same scanner but with computer interface). Features shared by both scanners are phase locked loop (PLL) triple conversion circuitry, 25 to 1300 MHz coverage (less cellular), 300 channel memory, AM and narrow/wide FM reception, 10 "in-



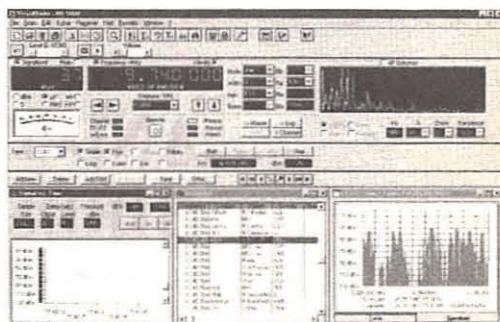
telligent" scannable memories for storing signals continuously active for 5 minutes or more.

A variety of scanning options include lock-out of up to 100 frequencies to be skipped during scanning, one-button access to nine preprogrammed service bands (police, weather, marine, aircraft VHF/UHF, fire/emergency, FM broadcast, TV VHF/UHF sound), protection against accidental operation, and choice of bands, memories or priorities to be scanned. The non-computer capable SC-1 is slated to retail for \$329.95.

The SC1PC with computer interface uses screen icons as a user-friendly assist to perform custom searches, scanner control and programming, and creation and management of data files. A CD-ROM of FCC-licensed frequencies is provided along with

the bi-directional interface cable and PC software. The list price for the computer version is \$419.95.

Sony's new entries are expected to be available in April, and will be carried by your favorite radio dealers, including Grove Enterprises, which is advertising the SC-1 at \$269.95 and the SC1PC at \$329.95. For more information or to order call 1-800-438-8155, email order@grove.net, or visit www.grove-ent.com



downs based control software for computer-capable scanners and receiver/transceivers from AOR, ICOM, Kenwood, Racial and Yaesu, plus the WiNRADiO card. Rhode & Schwartz and Watkins Johnson models are supported by the PRO version. The PLUS version of VisualRadio enables use of two other valuable radio accessories: the AOR SDU-5000 spectrum display unit and the Optoelectronics Scout frequency

VisualRadio

One more entry into the brave new world of computer/radio partnership is VisualRadio, a Win-

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counter.

Besides radio control via the screen-based virtual radio, VisualRadio's strength lies in database management. The German-based company designed the program to work especially well with the Klingenfuss Super Frequency List on CD-ROM (see What's New? Feb 98), though it will import any number of Microsoft Access compatible databases.

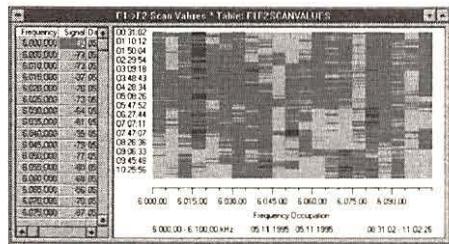
Operation and advantages are similar to those of other radio control packages, such as automatic programming, automatic logging, recording of .wav files, database analysis, customizable searches based on

any field, timer-controlled scanning, and much more.

VisualRadio Ver 2.03 is \$122, or \$212 for the PLUS version (includes postage, so slightly less to Europe). To enquire about pricing for the PRO version or to learn more about VisualRadio, email VisualRadio@compuserve.com, visit the website at <http://ourworld.compuserve.com/homepages/visualradio/> or contact general distributor Difona Communication GmbH, Att: Mr. Asmus, Sprindlinger Landstrasse 76, D-63069 Offenbach, Germany.

The Time and Temperature is...

One of the most valued office accessories of the MT editor is a digital clock which also gives the office temperature; it has helped resolve many



Visual Radio signal analysis.



disputes over the thermostat. (The outdoor temperature, however, is determined experientially come five o'clock!)

When the old standby time-piece refuses to be resurrected one last time, a tempting replacement will be the new Thermometer Clock from MFJ, giving 24 hour time and indoor and outdoor temperature in bold, 3/4 inch LCD characters. Another bonus feature is the MFJ-152's automatic update of the minimum and maximum temperature readings for the day. A memory function can also recall

the minimum/maximum readings for a period of time you want to measure.

What better accessory could you give a ham than the ability to tell the time and temperature! Ten feet of outdoor sensor wire and mount is supplied to allow best placement. The MFJ-152 Thermometer Clock is \$24.95 from dealers or call 800-647-1800 or email: mfj@mfjenterprises.com.

Access To The Airwaves

Few pirate radio aficionados have held the spotlight as long—and as often—as Allan Weiner. His broadcasting exploits as "Radio New York International" aboard an old freighter off the New York coast caught the world's attention, and his recent acquisition of a legitimate FCC license was astonishing, considering his reputation with the Commission. (See *Global Forum*-ed.)

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There are some well known CW/RTTY Decoders but then there is CODE-3. It's up to you to make the choice, but it will be easy once you see CODE-3. CODE-3 has an exclusive auto-classification module that tells YOU what you're listening to AND automatically sets you up to start decoding. No other decoder can do this on ALL the modes listed below - and most more expensive decoders have no means of identifying ANY received signals! Why spend more money for other decoders with FEWER features? CODE-3 works on any IBM-compatible computer with MS-DOS with at least 640Kb of RAM, and a CGA monitor. CODE-3 includes software, a complete audio to digital FSK converter with built-in 115V ac power supply, and a RS-232 cable, ready to use.

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- SWED-ARQ-ARQ-SWE
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- ARQ-AQ-R
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Throughout his life, from early childhood through adult confrontation with bureaucracy, Weiner has fought tirelessly for unfettered personal freedoms. But free speech on the airwaves was always his dominant theme. *Access to the Airwaves* is a personal chronology of Weiner's life as seen through his own eyes, and as told to Anita Louise McCormick.

McCormick is an accomplished writer and shortwave hobbyist, and her easy-to-read style combined with Weiner's liberal, sometimes counter-culture life style makes for compelling reading, unusual in an often predictable hobby niche like shortwave listening.

Access to the Airwaves is \$17.95 plus \$4.95 shipping from Loompanics Unlimited, PO Box 1197, Port Townsend, WA 98368.

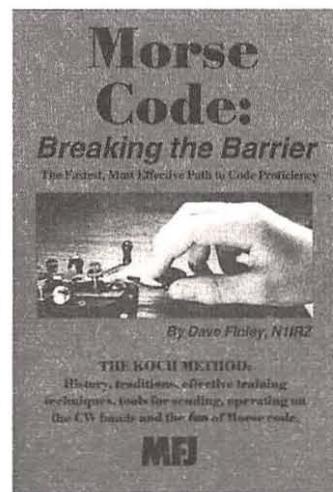
Morse Code: Breaking the Barrier

Another way of gaining access to the airwaves is through an amateur radio license. But, learning the Morse code has always been the turnoff point for most would-be hams. The attitude of many licensees seems to be, "I learned it, so you should, too!" Whether you feel that the Morse code is an antiquated relic of an obsolete era, or the most fun a radio hobbyist can encounter, the fact remains that, at present, to be a world-class amateur licensee, you must learn it.

Dave Finley's 100-page book, *Morse Code: Breaking the Barrier*, is essentially a history of Morse code through the ages—a retrospective, illustrated look at the services and vintage equipment which utilized this mode in the past. Later on, there is an extensive section showing and describing more recent ham Morse equipment and accessories.

The part telling how to master the code is in the middle, roughly a dozen pages describing the Koch method of learning to recognize groups of dots and dashes rather than memorizing their individual sounds.

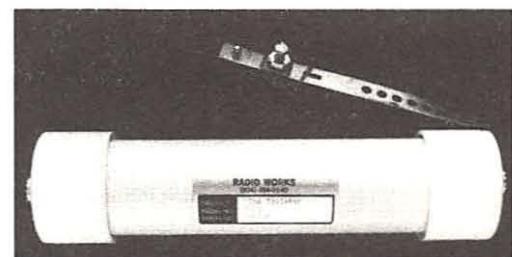
Morse Code: Breaking the Barrier is available for \$14.95 plus shipping from MFJ dealers or directly from MFJ Publishing Company, Starkville, MS 39759; mfj@mfjenterprises.com.



Line Isolator

The Radio Works' new T-4G Line Isolator™ is an unbalanced, current-type device to reduce stray RF on a coaxial cable's shield. This unwanted stray RF is often the result of antenna imbalance or direct pickup from the antenna. Line isolators remove stray RF without affecting the signal carried by the coax.

Technically, the T-4G, a grounded line isolator, achieves the maximum possible isolation by providing a direct path to ground for stray RF traveling



along the outer surface of the shield of coaxial feedlines. With the T-4G, stray RF on the coax does not see a secondary path to your station equipment because of the extremely high inductive reactance of the line isolator's windings.

If a direct earth ground is not available and the copper ground strap is not needed, the T-4 is available. The T-4 is inserted in series with coaxial cable connecting your transmitter to your linear and between your linear and your transmatch.

RF in the radio room can cause TVI, RFI, and RF feedback problems and the installation of line isolators is often the best and sometimes the only solution to these problems.

The introductory price of the T-4G is \$33.95 and the T-4 is \$29.95. Complete information is available on the World Wide Web at www.radioworks.com.

To request the paper version of the free Radio Works' General Catalog, email jim@radioworks.com or call 1-800-280-8327. You can also write or call the Radio Works at Box 6159, Portsmouth, VA 23703; phone 757-484-0140 or fax 757-483-1873.

Antennas West: the legend lives on

Owner Jim Stevens recently announced the closing of Antennas West, familiar to many readers for such wire antennas as the G5RV, TNT Windom, PicoJ, and TigerTail. However, the legend of these antennas will live on...

"One of the employees, Wayne Smith has retained the building and some of the stock, and is forming his own company," says

Allen Lowe of Arrow Antenna. "He will be selling several brands of antennas including Arrow Antennas." The address to contact is Antennas & More, 1038 South

350 East, Provo, UT 84606; 801-373-8426 phone/fax.

Lowe goes on to say, "Arrow Antenna has bought out most of manufacturing equipment and material and will be manufacturing some (not all) of the wire antennas that were made by Antennas West... All of the VHF and UHF aluminum antennas shown in Antennas West Catalog have been made by Arrow Antenna for almost five years, including the corner beams (corner reflector), the walking stick, the solid yagis, the rooftop J, the tracking antennas, including the satellite antenna, and the fox hunt attenuator."

Contact Allen Lowe N0IMW, Arrow Antenna, 1803 S. Greeley Hwy. #B, Cheyenne, WY 82007; 307-638-2369 phone, 307-638-3521 fax, for more information on these intriguing antenna designs or visit <http://Members.aol.com/Arrow146/index.html>

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The MFJ-418 Pocket Morse Code Tutor

Review by Skip Arey WB2GHA

Recently I had the opportunity to teach a ham radio license class. I was gratified to discover, despite common belief, that folks are still interested in learning International Morse Code. To get beyond the basic Technicians class license and to get access to amateur radio's HF bands, you still need the code. But many folks, including myself, find it hard to find the time to practice. The folks at MFJ Enterprises have come up with a device to make it possible to take code practice wherever you go.

The MFJ-418 is a diminutive, microprocessor-controlled box full of CW fun. Regardless of your skill level, this unit can serve to improve your overall code operating skill. Measuring just 2-1/4 by 4 by 1 inches, the unit fits easily into pocket or purse. The MFJ-418 is powered by one 9 volt battery. Audio gain is adjustable, and there is a headphone jack for private listening.

All aspects of the device's use are controlled by the power switch/volume control and three push buttons. From these simple controls you can set code speed from 3 wpm through 60 wpm. The speed can be adjusted "on the fly" without altering other settings during your practice. A series of simple menus allow you to set overall speed, Farnsworth style code practice (separate adjustment of character and spacing speeds), and tone.

You can set the learning style to suit your needs, from beginners to advanced to custom settings. The unit will send characters, groups, QSOs, words, callsigns and combinations. All of these audio features are further supported by the addition of a two-line scrolling LCD display that allows you to see what is being sent. It can be set to display the letters prior to sending the audio (good for initial



learning) or audio first followed by the lettering. Included is an 18 page, detailed manual and MFJ's 12 month warranty.

I've been carrying this little box around with me for the last several weeks and I've had a ball with it. I keep it in my briefcase and grab about fifteen minutes of practice every day at lunchtime. My goal is to push for 35 WPM so I can start to hang with the big dogs on the bottom end of 20 meters. Meanwhile, my son borrows the unit for a few minutes each night to prepare for his Novice test. Now that's versatility!

I recommend the MFJ-418 for anyone who wants to learn and then go on to fully master the International Morse Code. It's \$79.95 from MFJ Enterprises, Inc., 300 Industrial Park Road, Starkville, MS 39759, (601) 323 5869, Fax (601) 323-6551.

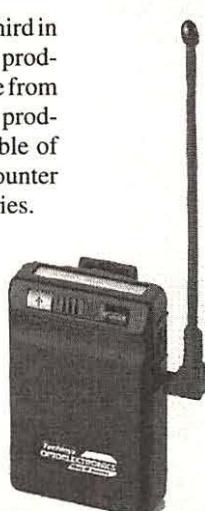
Techtoyz Micro RF Detector

Review by Haskell Moore, kb5wix@aol.com

The Techtoyz RF Detector is the third in a line of new, innovative electronic products housed in a pager-style enclosure from Optoelectronics. The previous two products include a DTMF decoder capable of storing 2000 digits and a frequency counter with a signal filter and three memories.

The RF Detector is a full featured electronic instrument in a very small, discreet package. In addition to displaying the signal strength of near field signals, it has several very useful options. For example, it may be configured with one of two beep modes, either sounding intermittently or continuously, when the adjustable threshold has been attained.

Depending on the user's preference, one of two display modes may be selected. In the digital mode, the ambient signal level, signal (audible beep) threshold, and



maximum signal level are displayed simultaneously as standard numeric digits. In the bargraph mode, two 24-segment bars are used to display the information.

Finally, it also has the ability to keep track of the number of times (up to 250) that the signal strength exceeds the preset threshold.

Potential uses for the RF Detector include transmitter calibration, antenna tuning and placement, tracking stuck transmitters, electronic counter-surveillance (i.e., bug detection), RF safety monitoring (by using

the audio alert function as an RF detector), radiation and emissions measurement (i.e., computer RF shielding), and coax leakage detection.

Specifications:

Frequency Range:	10MHz - 2GHz
Beeper Alarm:	Continuous or resettable
Hit Counter:	250 maximum
Signal Level:	Displays maximum signal level attained
Display:	Relative RF level (numeric or bargraph)
Dynamic Range:	30 dB minimum
Power:	1.5V AA Alkaline Battery (Approx. 15 hour run time)

The Techtoyz RF Detector sells for \$149.00 (US). The optional, but highly-recommended external antenna is an additional \$9.00. The full line of Techtoyz are available from Optoelectronics, 5821 NE 14th Avenue, Ft. Lauderdale, FL 33334 (800-327-5912 or 954-771-2050).

SCANNER EQUIPMENT

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Bob Parnass, AJ9S

Radio Shack PRO-2050 Trunk Tracking Scanner

The 300 channel Pro-2050 is Radio Shack's first base scanner which can selectively follow conversations in 800 MHz Motorola trunked radio systems. Uniden manufactures the PRO-2050 in Philippines for Radio Shack.

Feature-for-feature, the PRO-2050 is comparable to the portable Uniden BC235XLT Trunktracker, but has slightly less frequency coverage (see measurements table) and more powerful audio output.

As in the PRO-26 and PRO-67, the designers censored frequencies adjacent to the cellular phone bands so our PRO-2050 will not receive 823.9625 MHz. This frequency is licensed to local and state governments in Illinois, New Jersey, Texas, and other states.

Conventional Features

The PRO-2050 operates "like a Bearcat" and lacks the Program key and Monitor memories of other Radio Shack models. You program a conventional frequency by merely pressing the frequency digits then the Enter key. AM and NFM modes are factory set and not selectable. Its 300 channels are distributed among 10 banks and a 2 second rescan delay may be programmed on a per channel basis. A query feature identifies duplicate memory channels.

Various combinations of banks may be scanned and our PRO-2050 scans a mixture of frequencies at 78 channels/sec., skipping over empty channels. Individual channels can be locked out from memory scanning, and a simple keystroke sequence unlocks all nonempty channels in all banks.

One channel per bank can be designated a priority channel and sampled every 2 seconds. A single pair of frequency limits can be programmed for searching up or down, but searching and priority cannot be used simultaneously. Up to 50 frequencies may be locked out from a limit search versus 20 frequencies in the BC235XLT.

A single pair of limits may be programmed for a limit search. There is no Direct key or direct search facility, as found in GRE-made models. Factory preprogrammed frequencies for police, fire/emergency, commercial air, public service, and weather can be scanned by pressing the SVC key.



Radio Shack's trunk tracking base model.

Oddly, Radio Shack replaced the excellent marine service bank found in Uniden models with a "public safety" bank of 140 preprogrammed frequencies in the 800 MHz band. Many of them carried data transmissions in my area. Up to 20 frequencies can be skipped during a service scan, except weather frequencies.

Data Skip jumps over unmodulated and constant tone or data signals if they are strong enough. It is disabled when scanning AM aircraft or using priority scan.

Trunk Tracking

The PRO-2050 is designed to follow conversations in Motorola Type I, Type II, and Hybrid 800 MHz analog trunk systems. It will not track GE (Ericsson), E. F. Johnson, 400 MHz, or 900 MHz trunked systems, which must be scanned in the conventional mode. The PRO-2050 defaults to Motorola Type II systems, which divide a large number of users into several groups called talk groups. We programmed three public safety Type II trunked systems by entering their frequencies using the same procedure as a BC895XLT and BC235XLT.

The PRO-2050 skips over telephone calls and conversations on talk groups designated as private.

Each of the PRO-2050's 10 banks can be programmed with the frequencies for a single trunked system or with frequencies for conventional use, but you cannot follow trunked conversations and scan conventional systems at the same time. A Trunk key selects between trunking and conventional operation.

Talk group and fleet numbers, not frequencies, are dis-

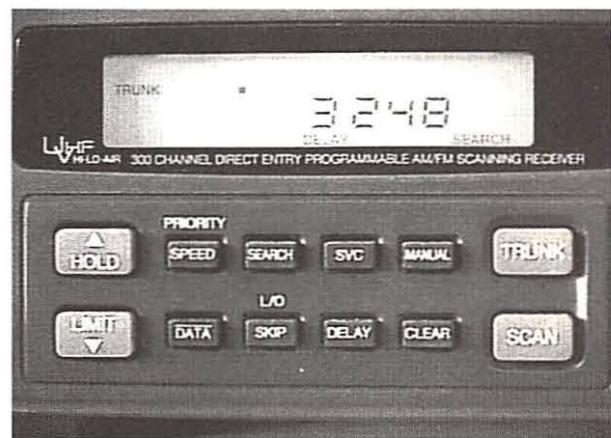
played while searching or scanning in the trunked domain. Fortunately, Uniden designed the PRO-2050's rescan delay, hold, and lockout facilities so operation is very similar in both trunk and conventional domains, like the other TrunkTracker models.

You can search or scan for active talk groups in the trunked domain and lock out up to 100 uninteresting talk groups. You can program up to five lists per bank with talk group numbers for scanning. Each list can hold up to 10 group IDs, though there's no warning of duplicate group numbers. See March 1997 *MT* for a more detailed description of the trunk tracking features in the BC235XLT, which work the same way.

Usability and Performance

The LCD display is easy to read and brilliantly backlit by an incandescent bulb through an orange filter. The lighting scheme is simple yet effective — the same as in the PRO-2040. We prefer it to the PRO-2006-type electroluminescent panel which wears out with use and is expensive to replace.

The volume and squelch knobs are too close together and it's difficult to adjust one knob without a finger bumping into the other knob. The rubber keypad has a good feel and a keypress confirmation beep can be enabled or disabled via a power on procedure. The tiny keytop lettering of the center keys has us squinting. The Manual key is perhaps the most important key in any scanner, but it is small and the same color and shape as most other keys on PRO-2050's central dashboard.

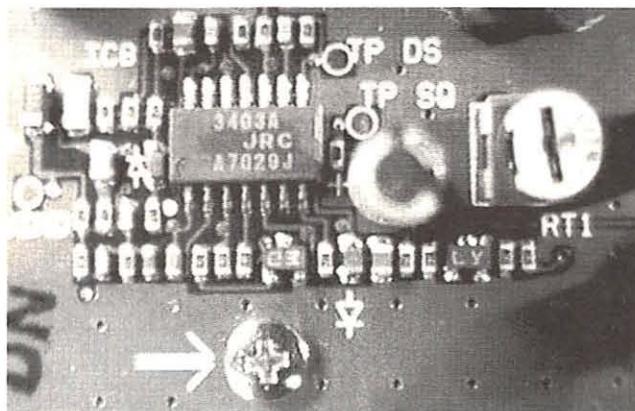


The PRO-2050 is lightweight because there is no chassis and the case is entirely plastic. Power is furnished by an included 12 VDC wall wart. Components are surface mounted on a main printed circuit board and a second board located behind the front panel. We connected a CTCSS display to the discriminator using the solder pad shown here, though this may void the warranty.

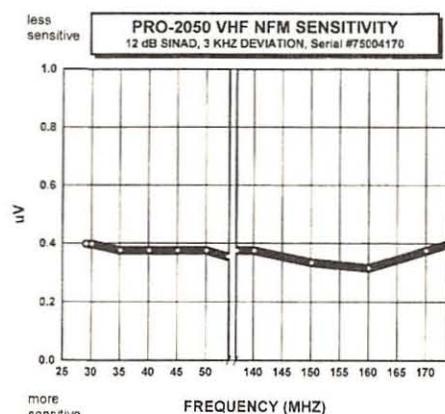
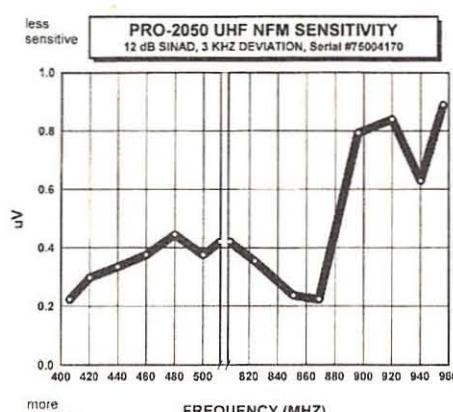
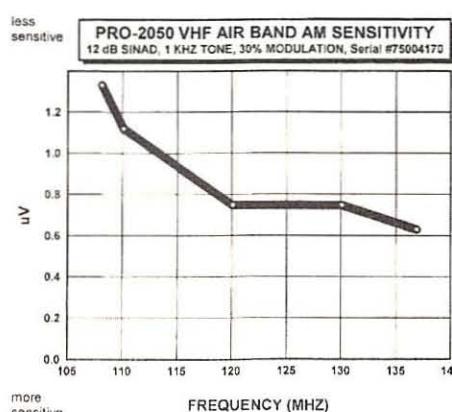
The triple conversion PRO-2050 employs IFs (intermediate frequencies) near 380.7, 10.85 and 0.450 MHz and the image rejection on our test unit is excellent at the frequency we measured. Our PRO-2050 reception is starkly "cleaner" than most of the other middle priced scanners we tested. It isn't plagued by intermod or image problems in the 160 MHz railroad band nor most of the spectrum while using an outdoor antenna.

We find relatively few birdies in our PRO-2050. Harmonics of the crystal controlled 10.4 MHz local oscillator are responsible for birdies at 31.2, 41.6, and 52 MHz, though they are weaker than the same birdies in our BC235XLT.

Audio output is crisp. Monaural headphones or an external speaker can be connected through a 1/8" jack on the front panel, but there is no Tape output jack.



Baseband audio connection at pad labeled TP DS.



MEASUREMENTS

Radio Shack PRO-2050
Scanner S/N 75004170

Frequency coverage (MHz):

29 - 54 (5 kHz steps)
108 - 136.975 (AM, 12.5 kHz steps)
137 - 174 (5 kHz steps)
406 - 512 (12.5 kHz steps)
806 - 823.9375, 851 - 868.9875,
896.1125 - 956 (12.5 kHz steps)

FM modulation acceptance: 14 kHz

Image rejection due to 1st IF:
63 dB at 155 MHz

Audio output power, measured at headphone jack:

0.86 W @ 10% distortion

Practical memory scan speed: 78 channels/sec.
Search speed, Turbo: 267 steps/sec.
Search speed, regular: 97 steps/sec.

Intermediate Frequencies:
380.7 (approx), 10.85, and 0.450 MHz

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To find other radio hobbyists, consult <http://www.grove-ent.com> for a listing of radio clubs and nets worldwide, or send an SASE for free list (NA only) to Club Circuit, PO Box 98, Brasstown, NC 28902. No local club? Join a managed email list (see p. 2) for your area of interest.

For hamfests in your area, visit <http://www.arrl.org/hamfests.html> or call the ARRL at 860-594-0200.

Drake's R8B: Is It Really the Best?—Part I

With the Drake R7 and R8, the first production units had problems that were corrected in subsequent manufacturing runs. So, with the R8B we decided to let Drake go through a number of production cycles so they could make any circuit adjustments that might be appropriate. As it turns out, our concern was unnecessary—Drake tells us that no “debugging” has been needed.

So, here is the first of two columns on our latest findings with this, the most popular tabletop shortwave receiver on earth. We've especially compared it with older Drake models to see whether it is, in fact, the hottest thing ever to emerge from Drake's laboratories.

■ Clobbers pre-1979 Drake models

To clear the deck, the R8B runs circles around virtually any Drake receiver made before 1979, such as the R-4 series, SSR-1, SW-4A and SPR-4. (We can't compare it to the DSR/MSR series, as we've never tested them.) To a lesser extent, it is a genuine step forward over the original R8 and R8A, as well as the current SW8.

This leaves only the ca. 1979-1985 Drake R7, R7A, R77 and R4245—the immediate predecessors of the R8 series—as serious contenders. The popular R7 and R7A are virtually identical, whereas the relatively rare R4245 (the R77 reportedly is identical) differs in performance from the R7/R7A only because it has a more stable tuning system. So we'll just refer to these models collectively as “R7” except where tuning stability is concerned.

■ Inboard multi-voltage power supply

The R8B tabletop communications receiver is virtually the same as the R8A, but with better selectable-sideband synchronous detection, more (1000) memory presets and faster scanning. It uses an inboard power supply, an improvement over some other tabletop models which, alas, use “wall-wart” AC adaptors. The R8B works off 90-110, 108-132, 180-220 and 216-264 VAC, 50-60 Hz, as well as from 11-16 VDC through a connector on the rear panel. The necessary separate fuses for AC



and DC are both inboard, a nice touch.

However, to run the R8B from 180-264 VAC requires that a resistor first be removed from the bowels of the receiver—a task Drake recommends be done by a trained service technician. Presumably going from 180-264 VAC to 90-132 VAC requires reinstallation of that resistor. Whatever, it is an amateurish and peculiar procedure unworthy of Drake.

The R7's inboard power supply covers the same voltages, but doesn't require anything other than the flipping a couple of switches. Score one for the R7. However, the R7 requires an inline outboard fuse when powered by DC, so...

■ Excellent tuning system and display

The R8B comes with all manner of well-thought-out tuning and scanning features. These include two VFOs; those (count 'em!) 1000 memory presets, which store just about every receiver operating parameter and also allow station name to be displayed; keypad and multi-speed knob tuning; up/down slewing in 100 kHz increments; all-mode squelch; and a variety of sophisticated scanning options. The R7 has nothing but a humble single-speed tuning knob, and in fact is one of the clunkiest receivers ever designed for “getting there from here.” If you're into frequency hopping, there's no contest: the R8B gets an “A,” the R7 a “D minus.”

The R8B's tuning is, of course, fully synthesized. It tunes and displays in 10 Hz increments, and our tests show the frequency readout to be accurate to within 20 Hz. There is virtually no chugging, and stability is to within 40 Hz from startup. Unlike the original R8, the R8B can display frequency in kilohertz,

including with the appropriate decimals, or megahertz if you so choose.

The R7, on the other hand, is tuned by a non-synthesized electromechanical PTO that can drift a whole kilohertz—1,000 Hz—from startup (the quasi-synthesized R4245 can drift up to 200 Hz). And the R7's frequency display is only in 100 Hz increments. So here, too, it's the R8B—no contest.

■ Features, features, features

The R8B and R7 both have two selectable antenna inputs. However, unlike the R8B, the R7 also has a converter port which acts as a deep-isolation third antenna input. Additionally, the R7 comes with an inboard splitter which allows either antenna #1 or antenna #2 to serve two receivers at the same time with negligible signal loss. On the other hand, the R8B handles both low- and high-impedance antennas, whereas the R7, in principle more than in practice, requires an outboard balun for high-impedance antennas to work at optimum efficiency. Here, it would appear to be a coin toss between the R8B and the R7, but in practice those with two receivers will almost certainly prefer the R7's setup.

For decades, Drake has been famous for its unsurpassed passband tuning circuits, which they now call passband offset (PBO). The R8B continues in this tradition, putting to shame comparable circuits in Japan Radio and other competing gear. Nevertheless, the tuning range of the R8B's PBO is greater than can be sensibly utilized, even on mediumwave. This wide tuning sweep makes it much fussier to tune than that of the R7, whose PBO is as close to perfect as you're going to get this side of the pearly gates. Here, give the R8B an “A minus”...an “A plus” for the R7.

Also included in the R8B are a tunable audio (AF) notch filter, a two-width noise blower, two 24-hour clocks, a timer, an attenuator, a switchable shortwave preamplifier, an accurate analog signal-strength meter, a front-panel-display dimmer, plus an RF gain control. The large LCD indicates the status of just about every receiver variable. To tilt the receiver to a com-

fortable angle for operation, the R8B comes with a flip-down elevation rod that's Gibraltar sturdy, but a fingernail-breaker to pull down.

The tunable AF notch filter works quite well, being deep, as in earlier versions, and to our pleasant surprise it is no longer difficult to tune. However, it won't kill hets of less than 500 Hz, which especially in the tropical bands can be a disappointment. The tunable IF notch filter on the R7 knocks out hets of a bit less than 500 Hz although, at some point, tuning it too low kills off the carrier. On the other hand, the R8B's AF notch zaps higher-frequency hets not reachable because of the R7's IF-based design. Again, a coin-toss.

The R8B's noise blunker in the "narrow" position is simply outstanding for coping with local electrical interference. However, the blunker on the R7 is also in the same league. As with all noise blankers available today, blanking action takes place only when the electrical noise is above the threshold of the received signal. Thus far, no manufacturer has attempted to produce a receiver with blanking that acts on noise more or less independently of that threshold—a pity, given the increased prevalence of electrical pollution.

Sophisticated clocks and timers

The R8B's two 24-hour digital clocks display seconds separately, a boon for DXers waiting for station IDs at the hour. (Why is it that not a single shortwave receiver with two clocks allows one to be in 12-hour "AM/PM" format for local time, the way normal people are used to it? At least the inexpensive MFJ-108B dual-time accessory clock gets it right.)

The clocks are easy to set, and come with 30-minute power backup. However, the clock display is shared with the frequency readout, even though Drake has cleverly designed this to be as painless as possible. On our receiver, the clock usually accurate to within better than a few seconds.

The R7's clock? Simple: there isn't one, much less two. Instead, I use a 1969 Tymeter 24-hour mechanical-digital desk clock with a synchronous motor. It is absolutely accurate day after day, week after week, so long as the electricity doesn't fail.

The R8B's clocks second as a pair of on-

off timers, which also trigger a DIN socket so as to turn on and off a tape recorder or similar device. Well, in principle, anyway: you may have a fruitless search if you hope to find a recorder that actually functions with this scheme. However, the R8B has no less than two line outputs for feeding tape recorders, RTTY demodulators and the like, along with an RS-232C PC port. No IF output, though—not much of a loss, as the R8B's 50 kHz IF won't readily interface with everyday 455/450 kHz devices, anyway.

Next month, the conclusion of the fascinating R8B story!

Japan Radio NRD-545 in the wings.

Although the forthcoming fully synthesized Japan Radio NRD-545 receiver has not yet been officially released here, it should be on dealers' shelves about the time you read this. Its street price in Japan is 178,000 yen, or about \$1,400.

Japan Radio apparently has been passing out early samples to selected individuals and organizations. We are not among these, and past experience has shown that there is almost invariably a good reason why a manufacturer wishes to keep our traditionally grouchy re-

views from making early impressions. The disappointing Japan Radio NRD-345 was just such a model, but of course we can't know how the '545 will fare until we actually put it through our full laboratory and hands-on paces.

Although comments circulating to date are predictable—"the best receiver ever" and such—there are signs that the flaws which one of *Passport to World Band Radio's* review team noted at an exhibition in Tokyo last year may not have been corrected. Even one of JRC's "optimistic" reviewers is now indicating that the synthesized audio sounds robotic and un-lifelike.

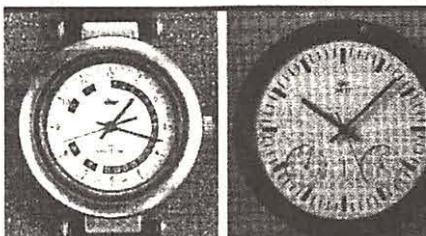
We'll see. As always, we will get our mitts on this receiver when it goes on sale to the public, then after running it through our chamber of horrors we'll lay out our findings in this column.

This equipment review is performed independently by Lawrence Magne and his colleagues in accordance with the policies and procedures of International Broadcasting Services, Ltd. It is completely independent of the policies and procedures of Grove Enterprises, Inc., its advertisers and affiliated organizations.

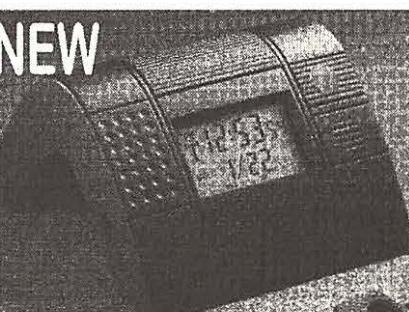
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How Suite It Is!

A Look at WiNRADiO's Digital Suite Product

If you have been following us the last few months you'll remember that we have been visiting the world of PC based receivers. We started with ICOM's new IC-PCR1000 and then went back to take another look at Rosetta Lab's WiNRADiO 1000i. Since the WiNRADiO's first review a few years ago by a major communications publication (that's us!), the software has gone through a number of major changes. To the company's credit, all updates have been available free-of-charge to WiNRADiO Customers via their Web Site (<http://www.winradio.com>)

About 16 months ago we looked at Rosetta Labs' first add-on program for the WiNRADiO, WinDatabase. This time we'll try Rosetta Labs Digital Suite, which is a dedicated add-on to WiNRADiO to provide decoding of digital signals and more. What modes does it decode? Is it equally useful across the wide frequency spectrum of the WiNRADiO receivers? What hardware/software does it require? How well does it do its job? Can it mix me a martini? Hold on! Let's take the questions one at a time.

■ Sophisticated Computer Requirements

In my estimation WiNRADiO 1000i is a great product. Its performance and price are hard to beat. But, for me, another feature that sold me on WiNRADiO 1000i is its very modest computer requirement. It runs great on a ham-show-bargain 486-66DX2 computer, with just 8 MEG of RAM and Windows 3.1. We even had it running in DOS mode on a Compaq 286. The simple, inexpensive computer requirements just add to the versatility of WiNRADiO's concept. But now — enter Digital Suite!

I opened the Digital Suite manual and read that the recommended computer was a Pentium 133 or higher with a sound card, and it would only run under Windows 95! I was disappointed. A quick check of WiNRADiO's website showed that these requirements were,



Figure 1 - Digital Suite's WeatherFAX capability

indeed, clearly stated. I guess I looked right passed them, assuming the simpler WiNRADiO 1000i requirements. Even the absolute minimum requirements list a Pentium 100MHz, sound card and Win 95. Humph. Well, get a cup of coffee and I'll move WiNRADiO into a Pentium 166 MMX machine running Win 95.

...OK, I'm back. Installing Digital Suite was a snap. Within a few minutes the software was loaded. Prior to turning the computer on, the single connection from the sound card line input to WiNRADiO audio output was made via the included cable. When WiNRADiO's software is started a new command line will appear in the Main Menu — Digital Suite. This is how all functions of Digital Suite are accessed. And, as with all decoding packages, setting the audio input level is a key factor to successful operation.

■ Leveling the "Playing" Field

Using Win 95's Volume Recording Controls (accessed from the Programs/Accessories/Multimedia menu), Line-In is enabled and its volume is set to near

maximum. Now the Audio Scope/Spectrum Analyzer function of Digital Suite is required. This is similar to a software product that we reviewed many years ago. I think it was called Pro Audio Spectrum Analyzer. It was one of the first useful PC instrumentation applications. Digital Suite's Scope can also be used as a stand-alone instrument.

Using an off-air signal, the volume control on the WiNRADiO panel is now adjusted. The WiNRADiO's volume is increased until the "clipping light," on the Audio Scope just begins to flash. I found that setting it a bit lower, so that no indication was observed, gave the best results. However, the best setting will be a function of your specific system and sound card. Remember to use the Windows Volume Control to set the speaker volume, not WiNRADiO's volume as you normally would.

■ What Can It Do?

With that level setting procedure behind us, let's look at the modes that Digital Suite can decode. There are eight featured items listed in the manual, but only three are actual "message" modes. These are FAX, ACARS and Packet.

The FAX mode supports decoding from HF sources and directly from satellite in the

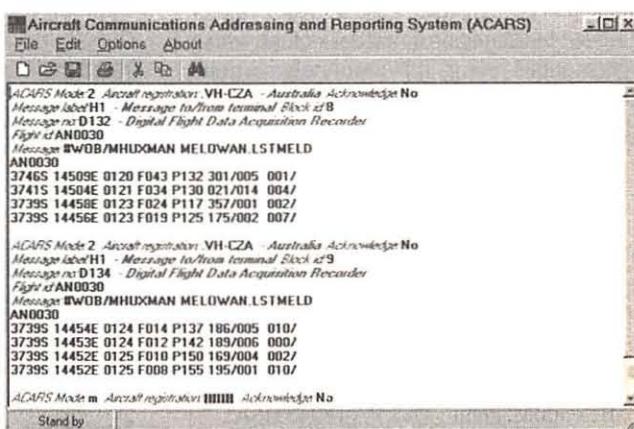


Figure 2 - Digital Suite's ACARS Screen

137 MHz band. It would also decode APT transmissions on 1691 and 1694.5 MHz, but the WiNRADiO 1000i does not tune that high.

Operation of the FAX mode was quite easy but required greater attention to input level setting. Using a longwire and a bit of patience, clear, clean maps were copied. FAX signals on HF are not as common as they were just a year ago.

In many ways Digital Suite's FAX mode reminded me of Software Systems Consulting's FAX products, which I rate as one of the best in the add-on market. There are lots of options and user-controlled parameters which make this FAX decoder very versatile, yet easy to use.

■ Swing Low, Suite Chariot

Moving to the VHF aircraft band, WiNRADiO was tuned to 130.025 MHz. ACARS is a digital mode, similar to Packet, which the airlines use for position, aircraft status, weather reporting and special passenger requests. You never know exactly what you'll read on ACARS!

Digital Suite copied ACARS as well as any program I have used. Weak signals, from aircraft over 100 miles away and descending to approach altitudes, still resulted in pretty clean copy. The ACARS screen is presented in a nice, simple, yet comprehensive manner. See Figure 2.

■ Still Higher to 2 Meters

Hams use packet on both HF and VHF. HF conditions were quite poor from my location when I ran Digital Suite. Therefore I decoded two meter (144 MHz) Packet signals. Capture of newly tuned Packet signals was quite quick with very little noticeable loss of copy. Screen scrolling was very fast. The ability to look at Packet signals with the scope is very interesting. You can almost tell which Packet station you are tuned to from its "signal print." To summarize: the Packet decoder works as well as any I've used.

■ It That All There Is?

So far we have covered four of the eight functions of Digital Suite (counting the scope function). Yes, I know, "It's not really a decode mode." Well, neither are the next two functions: CTCSS and DTMF. These are audio tone decoders and are very useful when

monitoring VHF/UHF remotes and repeaters which can be accessed via tones. But they are not digital message decode modes.

Another function of Digital Suite is its squelch controlled recorder. When the squelch is "broken" by a signal the Recorder feature is enabled. The resulting audio is recorded in a *.wav file. Very useful in a scanner environment. Well, that still leaves only three decode modes. Is that all there is?

No. Life is suite-r than that. First of all, advertising suggests that more modes are to come and, per the company's practice so far, these will be made available free of charge online to Digital Suite owners. Secondly, to my mind, Digital Suite, is a misleading title which detracts from the truly unique and powerful concept the program introduces: scanning based on signal analysis and classification.

We all know that some scanners can tell the difference between data and voice. But these are very crude methods based on how fast a resistor/capacitor network charges. Digital Suite uses the power of its Spectrum Analyzer (and I suspect, correspondingly fast hardware) to analyze and compare the spectral components of the signal. It *knows* the modulation content of the monitored signal.

■ Life Without Squelch - Almost

As the manual says, "... it is possible to implement 'intelligent scanning' ..." The user can select which class of signal should be bypassed. See Figure 3. This is the first time I have ever seen this implemented in a nondedicated surveillance receiver. For the first attempt it works quite well, and it is very useful in its present form in the VHF/UHF range.

The choices are limited to silent channel,

noise, data, and "other," including voice. Although not completely unnoticeable, the excluded signals were smoothly passed over. Think of the future scanner receiver: No more squelch circuits which remove weak, but desired, signals along with the noise; voice print access replacing tone access... The possibilities surpass science fiction.

■ Suite Final Analysis

Real nice product, regardless of the name. In its present form Digital Suite is not an extensive suite of digital signal decoders as the title implies. If that is what you are looking for you would do better with other programs, including freeware/shareware products.

But, if you are looking for a program which will make using your WiNRADiO a great scanner, with powerful advanced features, then look to Digital Suite, or should I say Digital Scanner Sweet. It's available for \$99.95 USD (plus \$15 shipping to the USA or \$5.50 if you order from Grove). Check www.winradio.com or www.grove-ent.com.

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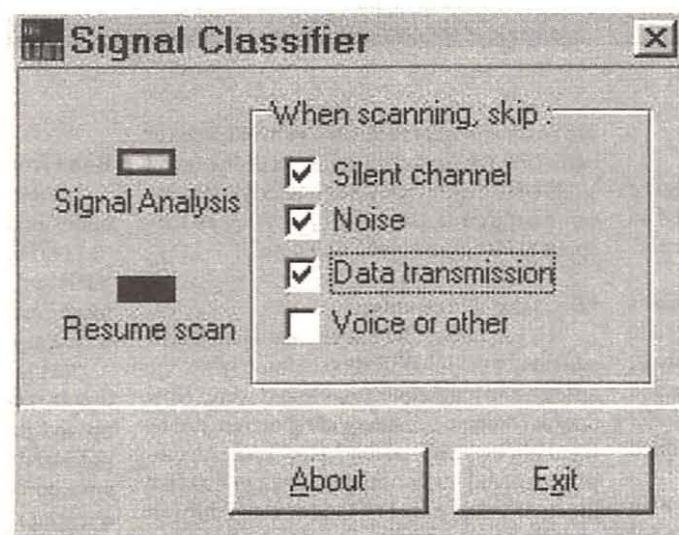


Figure 3 - "Intelligent Scanning" Signal Class Selection Screen

LETTERS TO THE EDITOR

NEWS AND VIEWS FROM OUR READERS

Rachel Baughn, Editor

Nigerian Scam?

Sue Wilden of Columbus, Indiana, sends a cautionary note about a scam ring based in Indianapolis asking for investors in "excess" oil profits in Nigeria.

"Letters are being sent to various businesses in the state and they are being signed by Tude Davies, Tome Adah, Peter Zik, Aliv Fawaz, Taribo Jaja, Degba Udeh, Godwin Uzoka and Dabo Jubril. Anyone who receives such a letter is asked to immediately contact the United States Secret Service.

"I am sending this because Voice of Free Nigeria is using an Indianapolis address for QSL requests and this may be a front for the scammers. Those who QSL this station need to be careful."

Uniden BC780XLT— No such thing?

"Contrary to a statement by me [and also Rich Barnett] based upon a news release from the Consumer Electronics Show (CES), Uniden officially denies that there is a product under development called a BC780XLT, nor any other number since the BC895XLT.

"While new product discussions are always topical with the company, they assert nothing matching the description is under development at this time."

—Bob Grove

PCR-1000: A discussion of methodology

Dave White of Hermitage, TN, wrote John Catalano asking for some clarification on his review of the ICOM PCR-1000 in the March issue of *MT*. Following is an "email round robin" between Dave, John, and Bob Grove:

"1.) Is this unit designed, or marketed, as a portable?...Is this really the way the typical potential user of the device is going to use it?

"2.) John seems surprised to find that 'the signals above 108 MHz were nowhere to be found using the HF tuned dipole.' I'm at a loss to understand why a receiver's inability to receive signals in one frequency range with an antenna designed for another can be considered the fault of the receiver.

"3.) After much globe hopping, antenna experimentation and side-by-side comparison, John finally concludes that the IC-PCR1000 works better with an external antenna designed for the frequencies one wishes to monitor than with the supplied 'whip' antenna. —The same

can be said of every receiver I've ever owned or used. Like the performance of an HF antenna at VHF/UHF frequencies, the underlying cause can be traced to the laws of physics as they apply to electromagnetic radiation."

“Dr. John’s” response:

"1.) First Dave, let me say that I had lots of mail about the IC-PCR1000 before I wrote the article. The major questions asked were: How does it compare to other wide spectrum radios (i.e., WiNRADiO 1000i)? How does it compare to standard communications radios like the R-71? How easy is it to use? Can I throw it in my suitcase and use it with my laptop on business trips? [In retrospect] it might have been helpful to have mentioned the fourth item in the article. The travel aspect did seem to dominate.

"2.) On your question concerning the 'tuned antenna' and physics, I'm sure you'll remember that inducing a dipole moment into a conductor does not require tuning. Of course the transfer of energy is greatest when the conductor is resonant to the radiation. But this is not a necessity.

"Also, remembering those tried and true engineering formulas, you will find that there is no such thing as a single frequency tuned element. Every tuned conductor can resonate at multiples of the wavelength. The wave number X of the antenna (i.e., wavelength times X) has a great effect on the bandwidth of the resulting conductor at a given frequency. But as long as it is an integral number of wavelengths the dipole moment will be transferred with minimum loss.

"I don't use a discone because of its 'unity gain' characteristic, but it strikes me that its element lengths are more conducive to fairly broad VHF/UHF coverage than is the HF dipole. Seems like using the HF tuned dipole over a wide range of HF frequencies would be a fairer (and more realistic) test of the receiver. Stated another way, using the HF dipole on VHF/UHF would probably yield about the same results as would the discone on HF.

"The point is, the operation I reported was a result of the wide range, untuned input stages. By necessity, the front end gain has to be designed low if expensive banks of tuned stages are not used. High, untuned gain stages, in a wide spectrum radio, results in high sensitivity. But it is unusable due to mixing products with cause QRM everywhere.

"3.) The bottom line performance obviously had to do with design tradeoffs rather than testing methodology — that point came through 'loud and clear'!"

Bob Grove adds:

"Good dialogue. But there are two more issues in defense of Dave's postulates:

"(1) High SWR from using the HF dipole at VHF and UHF will result in significant line losses, especially at the higher frequencies and with long coax leads.

"(2) Directivity at VHF/UHF with an HF dipole favors the ends of the wire, and radiates up and down as well, plus it is horizontally polarized in a vertically-polarized VHF/UHF environment. All of these will produce consequential reductions in reception."

Indiana Public Law 35-44-3-12

From Lawrence Estep of New Albany, Indiana, we print excerpts from his excellent letter to new Indiana State Senator, Connie Sipes. Lawrence told Bob Grove, "I am continuing my efforts to see our unfair Indiana statute overturned. I am sure you remember my case in 1991, as I was the subject of your September editorial that year. I am still gainfully employed in the local media, full-time now, but continue to see harassment of myself and others based on the misunderstanding of this travesty of a law."

Mrs. Sipes,

I am writing you today regarding Indiana Public Law 35-44-3-12, which concerns use of radios capable of receiving police frequencies ... I had the pleasure of being a student at New Albany High School, and was actively involved in the Radio and TV program there.

I continued to pursue this field after high school, and presently work for WDRB/WFTE in Louisville. I was a freelance videographer for our local Louisville area media outlets starting in 1990, and I became very familiar with local fire department officials, and even assisted with filming several events for them for use in training courses. I have also been an active weather spotter with the National Weather Service for nearly a decade, and my observations have assisted in issuing severe weather warnings for several Indiana counties during that time.

On July 25th, 1991, while pursuing freelance media activities, I was arrested, handcuffed, and taken to the Floyd County jail for violation of Indiana law 35-44-3-12, Unlawful Use Of A Police Radio. I had a police scanner in my vehicle, programmed with local fire, police, media, and weather service/storm spotter frequencies. This radio was not used for any

criminal purposes, but was used to assist me in my freelance videography and storm spotting....

Needless to say, I was subjected to severe humiliation, and treated like a criminal by local authorities, including being interrogated regarding my personal activities, ...and forfeiting my scanner... After explaining my situation to the local prosecutor, all charges were dropped. I was also thanked for my public service that I had performed before my arrest with the help of my scanner, including the severe weather spotting, and reporting several drunk drivers to police via CB radio as a member of REACT, a local volunteer CB group...

My concerns with the law, in its present unclear form, is that other law-abiding citizens may be harassed, arrested, and humiliated for providing a public service to their community, all because they simply possess a police scanner... If the law is loosely interpreted, even a citizen working with a neighborhood watch patrol walking or driving down their own street could be breaking the law. Severe weather spotters in mobile vehicles, monitoring local law enforcement, ham radio, and weather service reports, are definitely breaking the law.

[Lawrence wisely outlines what he considers reasonable restrictions on scanners, omitted for space constraints.]

I believe that the incidents of police scanners being used for criminal activities is far less than the incidents of such radios being used for the good of the community by law-abiding citizens such as myself. Bob Grove, author of *Monitoring Times* magazine, summarized this point best by saying, "Neighborhood patrols, crime watch teams, REACT chapters, and other scanner listeners—often in their cars—commonly provide critical information to public safety agencies of road hazards, accidents, locations of crime scenes and suspects, fires, and severe storms about which they hear over police broadcasts."

I believe that these issues were not considered by the authors of this statute, and that they only considered the criminal element in their decision-making. I hope you will continue the pledge of Senator Kathy Smith to look into this issue, and try and change this outdated and needlessly prohibitive law.

Strike three, I'm outta here

Bob Homuth, KB7AQD, responded to recent comments in *MT* about promoting radio hobbies in the newspapers and TV/radio news. Bob says, when he tried, these were the responses he got:

"The first reporter, recently retired from a

large newspaper and teaching my college newswriting class assured me that individuals should never have scanners or shortwave radios. It takes special skills to decipher the coded broadcasts — skills that only those on a major newsgathering staff can decode.

"I'm not with the police. I'm not a firefighter or rescue worker. I'm not even with the newspaper. To him — I do NOT need a scanner. Besides, I might spread panic if I tell anyone what really happens behind the scenes. (I bought two more scanners and a shortwave radio soon after!)

"The second reporter, a TV/Radio columnist, laughed out loud when I told him that the local ham club relays the Space Shuttle STS mission audio on 440 MHz repeaters. He wrote a column saying that 'Bob hears 'little green men' on his scanner....'

"Strike two....

"Once more ... A local TV news station advertised their number for hot news tips. Norb answered my call, and wondered what the local mall security channels were? I sent him a 200-frequency list of local UHF activity. He never called me back.

"Some months later, he did call back. A local self-styled militia got arrested for allegedly planning to destroy government buildings in Phoenix. Norb called me with the accusation, '...since you ham radio types work within these terrorist organizations all the time, tell me about your 'inside knowledge'?'

"I refused to even answer that insult. He then asked if any special stuff was going on at our local zoo.

"I replied, 'Gee, Norb. They have lots of animals....' End of conversation.

"How are hams expected to promote the hobby under such confrontational and stereotyped opposition? You can't get anthrax from a scanner, and a 70cm beam won't blow up buildings!

"I have not received a single complaint from Phoenix police, sheriff's officers, mall security, park rangers, or anyone else with authority and half a brain. What makes these reporters ... get apoplectic over Bob listening to weather reports, the Space Shuttle, and local businesses?"

Dear Monitoring Times,

Just want to thank you for the fun I have every month reading your magazine. Over the years I have enjoyed my Ham ticket more by reading *MT*, and have become active in other aspects of the radio hobby. I really have learned a great deal by reading *MT*, thank you so much for such an entertaining, educational publication.

—Jim Mooney KB5QAC, Albuquerque, NM

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Publisher

Taking Credit Where Credit isn't Due...Again

I don't ordinarily indulge in "League bashing"—there are plenty of others out there already doing that. But a recent membership solicitation from David Sumner, K1ZZ, Executive Vice President of the American Radio Relay League (ARRL), was just too much to ignore.

Sumner lists several ostensible examples of how the League helps hams. One imaginative example describes their initial response to last year's initially-proposed anti-scanner legislation: "The ARRL spotted this legislative Trojan horse immediately and intervened successfully to alter the bill in our favor."

Fact: When *MT*'s assistant editor, Larry Van Horn, contacted the League's own legislative representative, Steve Mansfield, to alert him to the impending disaster, Mansfield shrugged the matter off, reflecting the League's traditional response: It's the scanner folk's problem.

It wasn't until *MT* had allied with more perceptive members of the communications profession, and had already mustered active opposition to the impending Bill, that the League realized that the hams would also be affected. Along with other representatives of the radio industry, they met with the Congressional staff and did help influence the outcome.

But their too-little, too-late, response has been costly to the hams. The FCC is preparing to decertify amateur radio equipment that can be altered for extended frequency coverage. Understandably, the League hasn't taken credit for that.

Such inertia and historical revisionism is reminiscent of earlier ARRL press releases, such as the one patting themselves on the back for supporting no-code licensing. In fact, the League vigorously opposed the no-code movement, but decided to take credit for that, too, after it became clear that the FCC was about to authorize it.

If you don't remember this, ask one of the League's old timers (and there are plenty of those) if he still has one of the offensive buttons worn by ARRL representatives at hamfests which said, "Stop Bitching; Learn the Code!" I'm sure this confrontational attitude toward newcomers really helped build League membership.

■ Listeners' Advocacy

MT is often asked to start a listeners' advocacy movement to protect the rights of radio enthusiasts who are at the mercy of ill-advised, repressive legislation, such as that which we nearly

experienced and successfully opposed last year. Had it not been for the concerted effort of thousands of irate radio hobbyists, hams, engineers, and manufacturers, Markey's original HR1984 and Tauzin's HR2369 bills, as choreographed with the cellular lobby, would have effectively shut down the scanner industry and deprived scanner listeners their legitimate access to the airwaves.

But would listening hobbyists rally to support such an umbrella organization the way a sizable number of hams support the ARRL? The Association of North American Radio Clubs (ANARC) attempted to mediate the needs of shortwave and scanner clubs for many years, even sponsoring annual conventions around the U.S. and in Canada, but never grew to an impressive membership. ANARC still exists, has their weekly ham radio net, and helps correlate member-club activities, but meets quietly at the SWL Winterfest in Kulpsville, Pennsylvania.

Probably the main difference between radio amateurs and SWL/scannists is that the hams have more of a fraternity, a history. They go back to the earliest days of radio, have invented countless electronic technologies and products, have a common licensing requirement, are tested to prove their skill levels, and provide emergency communications during disasters. And perhaps most important, they use their common interest to communicate with one another over the airwaves, breaking down cultural and social barriers, exchanging information.

Hobby listeners have no such common ground; they buy their radios from Wal-Mart, Radio Shack, or some catalog discounter (and, hopefully, *MT* advertisers!), and sit back, passively listening without intercommunicating. They don't have to show their mettle to anyone. Thus, they are largely uninspired to become involved in movements since they don't feel they are part of a group and, therefore, have no larger loyalties.

There are approximately 600,000 hams, and some 171,000 of them belong to the ARRL and receive *QST* magazine. There are more than ten million scanner listeners, but the combined subscriptions to *MT* and *PopCom* are only in the tens of thousands. Who could do the work, and how would they be paid?

Our listening hobby, as enjoyable as it is, will remain secondary to other, more pressing activities. Future conflicts will arise, and motivated members will take action. But a concerted lobby is unlikely. Fortunately, the immediate alert capabilities of the Internet are on our side. For the first time, this exquisite tool of technology saved us from being swept under the rug by powerful special interests. It will do it again.

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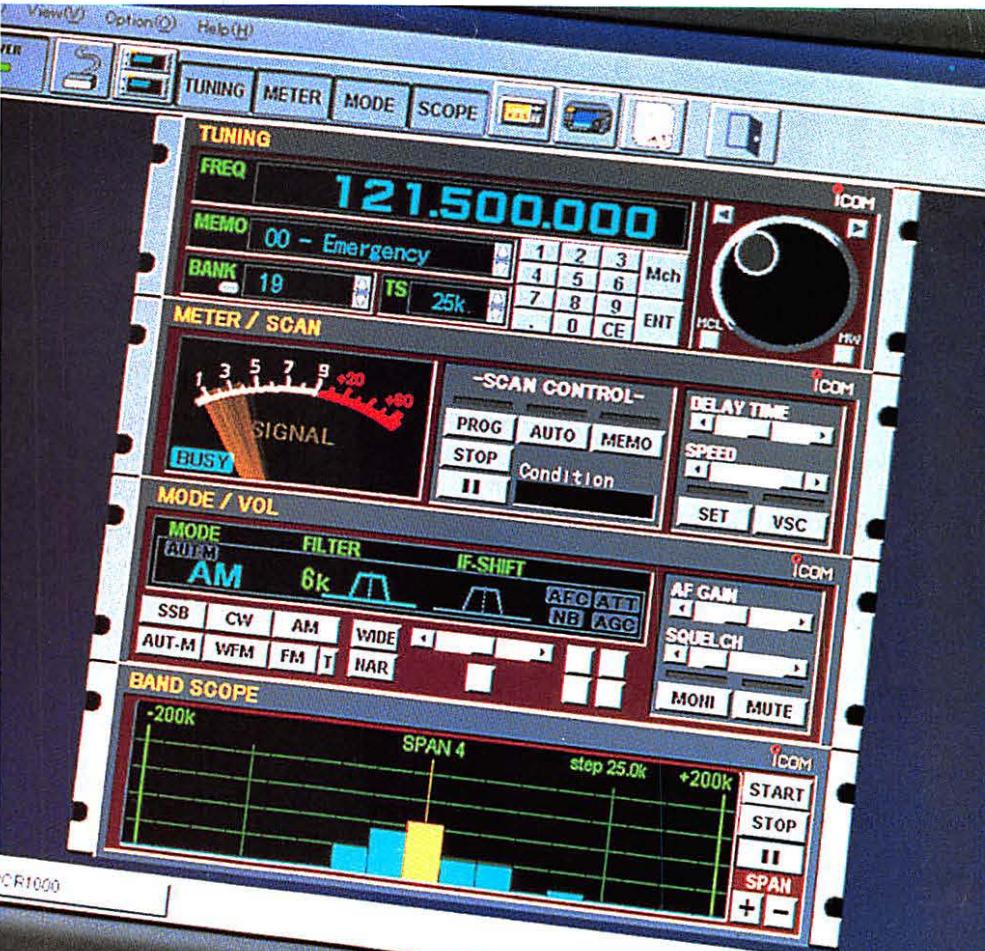
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